

**IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF CALIFORNIA**

**CONFIDENTIAL--TO BE FILED UNDER SEAL  
SUBJECT TO PROTECTIVE ORDER**

**IN RE: CATHODE RAY TUBE (CRT)  
ANTITRUST LITIGATION**

**Case No. 07-CV-5944-JST**

**MDL No. 1917**

**THIS DOCUMENT RELATED TO:**

**ALL DIRECT PURCHASER ACTIONS**

**EXPERT REPORT OF PHILLIP M. JOHNSON, PH.D.**

**November 19, 2021**

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## I. Experience and Qualifications

1. My name is Phillip M. Johnson. I am an economist and a Managing Director at Econ One Research, Inc. (“Econ One”). Econ One is an economic research and consulting firm with offices in the U.S. and abroad. I have a doctoral degree in economics from the University of California at Los Angeles and a bachelor’s degree in economics from California State University at Northridge. I was formerly an Assistant Professor of Economics at Instituto Tecnológico Autónomo de México (ITAM).
2. Since joining Econ One in 2000, I have worked extensively on the analysis of markets and the assessment of antitrust impact and damages, as well as the analysis of economic issues relating to employment, intellectual property, and other subjects. I have analyzed antitrust impact, damages, and class certification-related issues in numerous industries, including alleged no-poach, or no-hire agreements. I have provided expert testimony, declarations, and reports to state and federal courts. Over the course of the past decade, I have analyzed impact and damages relating to collusion in the CRT industry. I have also analyzed impact and damages from alleged anticompetitive conduct in other industries, including TFT-LCD, lithium-ion batteries, and single-serve coffee pods. A more detailed summary of my training, experience, and prior testimony is shown in **Exhibit 1**.
3. Econ One is being compensated for the time I spend on this matter at my normal and customary rate of \$550 per hour. Econ One is also being compensated for time spent by research staff on this project at their normal and customary hourly rates ranging from \$195 to \$350 per hour. Econ One’s compensation in this matter is not tied to the outcome of the litigation.
4. A list of materials I have relied upon in preparation of this report is provided in **Exhibit 2**. I have relied on the best information available to me at the time of the preparation of this report. I reserve the right to consider any further relevant evidence that might emerge and to supplement or amend my conclusions as necessary.

## II. Assignment and Summary of Conclusions

5. I understand that Plaintiffs allege that the Defendants Irico Group Corporation and Irico Display Devices (together “Irico Defendants” or “Irico”) and their co-conspirators<sup>1</sup> engaged in a price-fixing conspiracy for the purpose of fixing, raising, maintaining and/or stabilizing prices of cathode ray tubes (“CRTs”) and that CRT products (CRTs and finished products incorporating CRTs) were sold at elevated prices in the United States between March 1, 1995 and November 25, 2007 (the “Class Period”). Plaintiffs are direct purchasers of CRT products from the Irico Defendants and co-conspirators. Plaintiffs’ counsel propose a class of purchasers as follows:

All persons and entities who, between March 1, 1995 and November 25, 2007, directly purchased a CRT Product<sup>2</sup> in the United States from any Defendant or any subsidiary or affiliate thereof, or any co-conspirator or any subsidiary or affiliate thereof. Excluded from the class are defendants, their parent companies, subsidiaries and affiliates, any co-conspirators, all governmental entities, and any judges or justices assigned to hear any aspect of this action.

6. I have been asked by Plaintiffs’ counsel to assume the existence of the alleged conspiracy and to then form an opinion regarding the following questions:
- Whether there is evidence common to members of the proposed Class that is capable of showing that the alleged conspiracy impacted all or almost all members of the Class;

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<sup>1</sup> I understand that Defendants and co-conspirators are (1) Irico Group Corporation, Irico Group Electronics Co., Ltd., and Irico Display Devices Co., Ltd. (collectively “Irico”); (2) Chunghwa Entities; (3) Orion Entities; (4) Hitachi Entities; (5) LG Electronics Entities; (6) LG Philips Display; (7) Panasonic Entities; (8) Philips Entities; (9) Samsung Entities; (10) Thai-CRT; (11) Toshiba Entities; (12) MT Picture Display Co., Ltd.; (13) Beijing-Matsushita Color CRT Company, Ltd.; (14) Technicolor SA (f/k/a Thomson SA) and Technicolor USA, Inc. (f/k/a Thomson Consumer Electronics, Inc.) (together, “Thomson”); (14) Mitsubishi Electric Corp.; Mitsubishi Digital Electronics America, Inc.; and Mitsubishi Electric & Electronics, USA, Inc. (together, “Mitsubishi”).

<sup>2</sup> I understand CRT products include CRTs, CRT TVs, and CRT monitors.

- b. Whether the economic evidence supports Plaintiffs' allegation that the conspiracy was successful in raising prices of CRTs and CRT finished products above competitive levels;
  - c. Whether there is a reliable Class-wide formulaic method capable of quantifying the overcharges incurred by the Class as a result of the alleged conspiracy.
7. The conspiracy in this case is alleged to have begun in 1995 and continued operating (at least in some fashion) through the commencement of the Department of Justice investigation of the industry in November 2007. According to the Complaint, Irico Defendants and co-conspirators:
  - a. Established targets for minimum prices of various CRTs defined by size and application, as well as elevated market price levels for CRTs overall;
  - b. Agreed to restrain output and capacity;
  - c. Discussed and agreed upon prices as to specific customers; and
  - d. Exchanged information on pricing, shipments, capacity, output, and production line status for CRTs.
8. In the course of my work on this assignment, my staff and I have reviewed extensive data, documents and testimony developed through the course of discovery in this case. A list of the materials we have reviewed is included as Exhibit 2. Based upon my review and analysis of these materials, I have concluded that there is evidence common to members of the proposed Class that is sufficient to prove widespread impact. This evidence involves:
  - The broad extent of communication and cooperative activities within the alleged conspiracy;
  - Activities that would have assisted the alleged conspiracy in constraining output of CRTs;
  - The alleged conspiracy's control over the vast majority of sales;

- Regression analysis showing prices of CRTs to be largely determined by factors that are common to Class Members;
  - Jointly determined “Target Prices” for CRTs representing the vast majority of total sales;
  - Structural elements in CRT pricing that tended to link prices for CRTs of different types and sizes;
  - Regression analysis showing that “Target Prices” established through the alleged conspiracy had a demonstrable effect on actual prices paid;
  - The existence of other market characteristics which would be expected, as an economic matter, to cause the effects of conspiratorial behavior to be felt broadly across customers;
  - Regression analysis of overcharges showing that CDT prices were elevated by as much as 10.5% and CPT prices were elevated by as much as 8.3%; and
  - Regression analysis of CRT prices showing that customers accounting for nearly all Class Period sales were likely to have been impacted.
9. I set forth the basis for these conclusions below. I understand that discovery has not yet been completed and that further evidence might emerge that is relevant to my analysis. I intend to consider additional evidence as it develops and may revise my conclusions or supplement their evidentiary basis as warranted by that evidence.

### III. CRT Industry Background

10. CRTs were the dominant technology used in televisions and computer monitors, automated teller machines, gaming devices, measuring instruments and electronic medical devices (collectively “display products”) from the 1950s into the 2000s.<sup>3</sup>

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<sup>3</sup> For a brief history of CRT technology see EPA, “Computer Display Industry and Technology Profile,” December 1998, 1 and 3-4, [http://www.epa.gov/dfe/pubs/comp-dic/tech\\_reports/index.htm](http://www.epa.gov/dfe/pubs/comp-dic/tech_reports/index.htm) and Industry and U.S. International Trade Commission, “Industry & Trade Summary: Television Picture Tubes and Other Cathode-Ray Tubes,” Publication 2877, May 1995, 1 and 11, [http://www.usitc.gov/publications/332/working\\_papers/pub2877.pdf](http://www.usitc.gov/publications/332/working_papers/pub2877.pdf). See also PHLP-CRT-051982-PHLP-

Since then, liquid crystal displays (“LCDs” or “TFT-LCDs”) have supplanted CRTs in most display applications.<sup>4</sup>

### **A. Product Description**

11. A cathode ray tube (“CRT”) is a funnel-shaped glass device which translates electronic video signals into visual images. The main components of a CRT are an electron gun assembly, a deflection system and a phosphor-coated screen, all encased in a large vacuum-filled glass bulb.<sup>5</sup> The electron gun, placed at the rear end of the bulb, consists of a negatively charged cathode which emits electrons when heated and a positively charged anode which directs the electrons into a narrow beam and accelerates them towards the screen.<sup>6</sup> The electron beam passes through a deflection system that aims it vertically and horizontally, towards the right spot on the screen.<sup>7</sup> The screen is coated with phosphors which illuminate when the electron beam strikes. Images are produced as the incoming video signal generates electron beams of varying strengths that rapidly scan the screen up and down and back and forth, creating illumination patterns that the human eye recognizes as images.

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CRT-052085 at 052057.

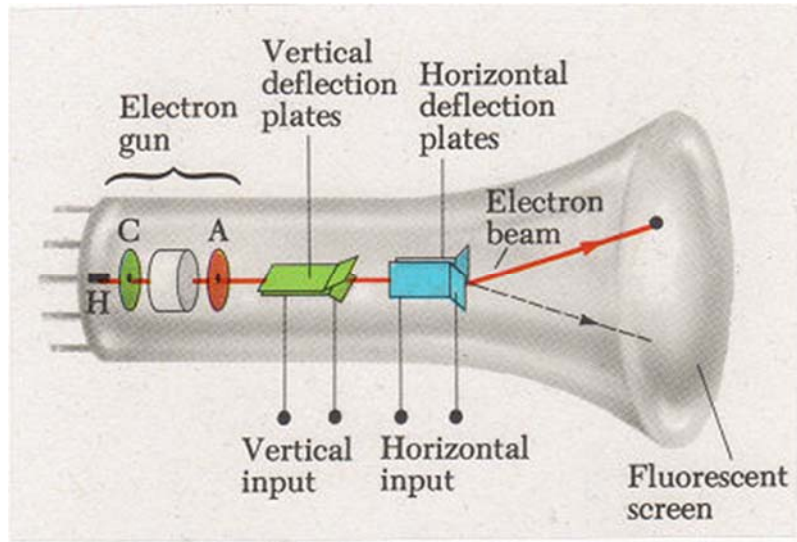
<sup>4</sup> Paul Sakuma, “Flat panels drive old TVs from market,” *USA Today*, October 22, 2006, [http://www.usatoday.com/tech/products/gear/2006-10-22-crt-demise\\_x.htm](http://www.usatoday.com/tech/products/gear/2006-10-22-crt-demise_x.htm); Hitachi, “Hitachi’s Flat-panel TV Business Strategy,” April 18, 2007, 7 and 10, <http://www.hitachi.com/IR-e/library/presentation/070418/070418.pdf>; PR Newswire, “Stanford Resources Experts Forecast Major Shifts in CRT monitor Marketplace,” New York, October 2, 2001, <http://www.prnewswire.com/news-releases/stanford-resources-expert-forecasts-major-shifts-in-crt-monitor-marketplace-73466017.html>.

<sup>5</sup> For detailed descriptions and a schematic diagram of the design and construction of CRTs see U.S. International Trade Commission, “Industry & Trade Summary: Television Picture Tubes and other Cathode-Ray Tubes,” May 1995, 1-2, [http://www.usitc.gov/publications/332/working\\_papers/pub2877.pdf](http://www.usitc.gov/publications/332/working_papers/pub2877.pdf) and EPA, “Computer Display Industry and Technology Profile,” December 1998, 12-13, [http://www.epa.gov/dfe/pubs/comp-dic/tech\\_reports/index.htm](http://www.epa.gov/dfe/pubs/comp-dic/tech_reports/index.htm).

<sup>6</sup> Polychromatic CRT tubes contain three electron guns, one for each color - red, green and blue; unlike monochromatic tubes that contain only one electron gun and produce a black-and-white image. See Fleischmann, Mark, “The Big Picture,” *Popular Science*, November 1994, 84 and 92. For an overview of CRT technology, see Laurel M. Sheppard and C. Cavette, “Cathode-Ray Tube,” <http://www.madehow.com/Volume-2/Cathode-Ray-Tube.html#b>.

<sup>7</sup> See PHLP-CRT-051982-PHLP-CRT-052085 at 052057.



**Figure 1: Elements of a CRT<sup>8</sup>**

12. This basic design of the CRT remained the same for over half a century, though technological progress and refinement of materials allowed the quality to improve over time. These improvements included reduced ‘warm up’ time and ‘flicker’, sharper images and bigger, flatter screens with minimum curvature. High definition televisions with scanning rates more than twice those of conventional systems became possible with improved electron gun design as well as new glass materials. More recent improvements included ‘Superslim’ and ‘Ultraslim’ CRTs (introduced by LG Electronics and Samsung, respectively).<sup>9</sup>

### **B. Product Varieties**

13. CRTs differed mainly by type of use, size, and display resolution, though other characteristics, such as shape, sometimes varied as well. The vast majority of CRT displays sold during the Class Period were able to display color images. CRTs were

<sup>8</sup> Quarkology.com, “9.4.A- Cathode Rays,” <http://www.quarkology.com/12-physics/94-ideas-implementation/94A-cathode-rays.html>.

<sup>9</sup> CDRinfo, “LG Super-slim CRT set to change entry-level television market,” <http://lux.cdrinfo.com/Sections/News/Details.aspx?NewsId=13874>; PR Newswire, “LG Philips Displays Brings SuperSlim Technology to the U.S. Market,” January 6, 2005, <http://www.prnewswire.com/news-releases/lgphilips-displays-brings-superslim-technology-to-the-us-market-53883862.html>; Samsung, “Samsung SDI Develops the ‘Ultra-slim and Flat CRT,’” <http://www.samsung.com/us/news/517>.

sometimes sold in different stages of assembly. A CRT sold without a deflection yoke was called a “bare” CRT, while those sold with a deflection yoke were characterized as having an “integrated tube component” (ITC). CRTs used in televisions are often referred to as “CPTs” (color picture tubes). CRTs used in computer monitors and other similar devices like ATMs are referred to as “CDTs” (color display tubes). The basic technology of CDTs and CPTs is the same. CDTs accommodate the higher resolutions desirable for computer monitors while CPTs display brighter pictures to accommodate daytime TV viewing.<sup>10</sup>

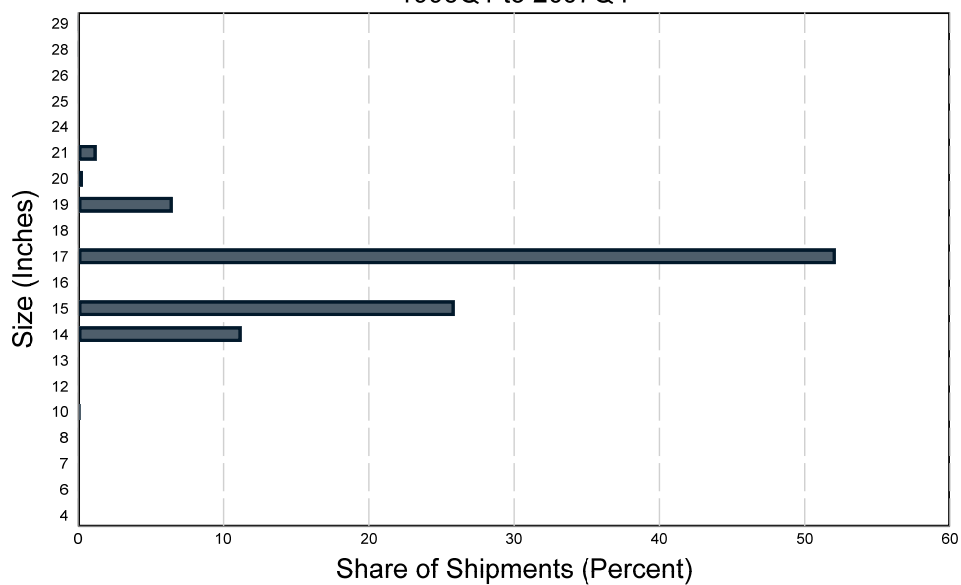
14. The quality of the viewing experience generated by a CRT is determined by a number of different characteristics. The two most important characteristics are the screen size and resolution. The screen size, defined as the diagonal distance measured in inches, determines the viewable area. As depicted in Figure 2 and Figure 3 below, the most widely produced sizes for CPTs were 14, 20, 21, and 29 inches; for CDTs the most widely produced sizes were 14, 15 and 17 inches. These sizes accounted for about 78 percent of total CPT sales and about 89 percent of CDT sales during the class period.

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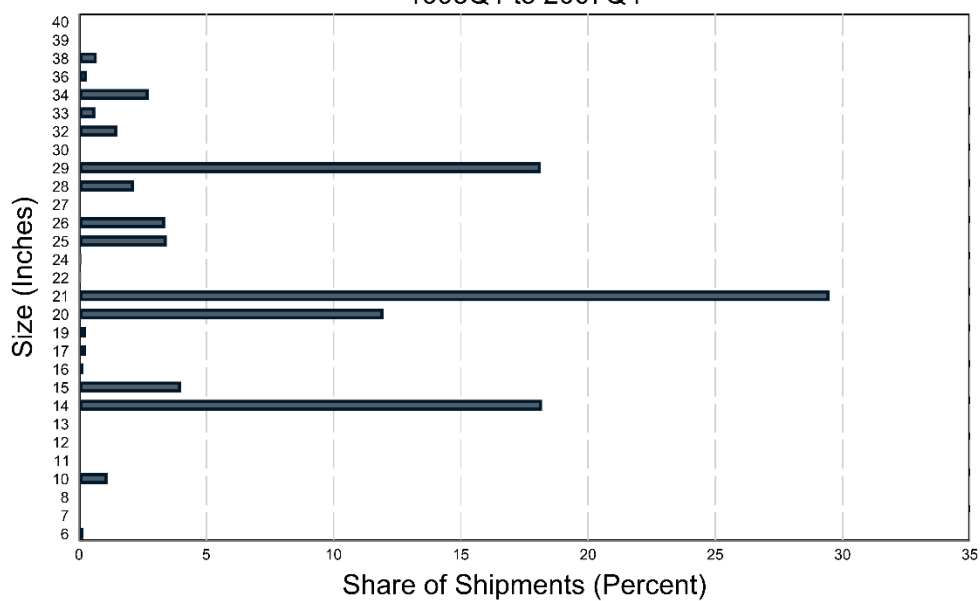
<sup>10</sup> SDCRT-0021278-SDCRT-0021294 at 1288-1289 and SDCRT-0202981 at 6 and 12. See also, Deposition of Mok Hyeon Seong (LGE), July 9, 2012 at 97:13-98:9 and Deposition of L. Thomas Heiser (Hitachi), July 3, 2012 at 59:3-60:4.

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**Figure 2**Size Distribution of CDTs  
1995Q1 to 2007Q4

Source: CRT Manufacturers' Sales Data.

**Figure 3**Size Distribution of CPTs  
1995Q1 to 2007Q4

Source: CRT Manufacturers' Sales Data.

### C. The CRT Defendants and Co-Conspirators

15. The Defendants and co-conspirators in this matter (described in Appendix A) were generally large multinational corporations (or their subsidiaries), including: (1) Irico Entities (Irico); (2) Chunghwa Entities (Chunghwa); (3) Orion Entities (Orion); (4) Hitachi Entities (Hitachi); (5) LG Electronics Entities (LG Electronics); (6) LG Philips Display Entities (LPD); (7) Panasonic Entities (Panasonic); (8) Philips Entities (Philips); (9) Samsung Entities (Samsung); (10) Thai-CRT; (11) Toshiba Entities (Toshiba); (12) MT Picture Display Co., Ltd. (MTPD); (13) Beijing-Matsushita Color CRT Company, Ltd. (BMCC); (14) Mitsubishi Entities (Mitsubishi); and (15) Thomson Entities (Thomson).
16. CRTs were sold to electronics product manufacturers, primarily for the manufacture of computer monitors and televisions. These product manufacturers included original equipment manufacturers (“OEMs”), which sold finished products under their own brand name. Product manufacturers also included contract manufacturers (“CMs”), which made finished CRT products for other brand name sellers. There were two types of CMs, Electronics Manufacturing Services (“EMSs”), which made products according to their customers’ designs and Original Design Manufacturers (“ODMs”) such as TVP Technology,<sup>11</sup> which owned and developed the product design.<sup>12</sup> Defendants and co-conspirators also sold CRTs to distributors such as TT Electronics,<sup>13</sup> which then resold them to smaller OEMs and CMs. Some members of the alleged conspiracy, including Hitachi, LG Electronics, Panasonic, Philips, Samsung, Toshiba, Mitsubishi, and Thomson also produced computer monitors or televisions incorporating the CRTs they manufactured. These were sold mainly to retailers such as Best Buy, Fry’s Electronics, Wal-Mart, Circuit City, and Sears.

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<sup>11</sup> Bloomberg, “Company Profile for TPV Technology Ltd. (903),” <http://www.bloomberg.com/quote/903:HK/profile>.

<sup>12</sup> See Austin Weber, “Outsourcing’s Alphabet Soup,” *Assembly Magazine*, February 1, 2003, 8, <http://www.assemblymag.com/articles/82852-outsourcing-s-alphabet-soup> (accessed 04/1/2013).

<sup>13</sup> TT Electronics, “About Us,” <http://www.ttelectronics.com/about/>.

#### D. Changes in CRT Demand over Time

17. CRT televisions were first introduced to the American public in 1939 at the World's Fair by RCA,<sup>14</sup> and color CRT televisions appeared in the 1950s.<sup>15</sup> Until the later part of the 1990s, CPTs were the dominant display technology used in televisions. In addition, CRT monitors became "the dominant method for interfacing with computers in the early to mid-1970s"<sup>16</sup> with the release of the Apple I and the Sol-20, "the first computers with factory video outputs in 1976."<sup>17</sup> The CRT industry steadily grew through the end of the 20<sup>th</sup> century and in 1999, global CRT monitor sales peaked at almost \$20 billion.<sup>18</sup>
18. Over time alternative display technologies emerged and by the end of the alleged conspiracy period, largely supplanted CRTs. These alternatives included TFT-LCDs and Plasma Display Panels (PDPs).<sup>19</sup> TFT-LCDs first emerged in the 1960s and began to be implemented in small portable devices such as digital watches and pocket calculators.<sup>20</sup> TFT-LCD technology quickly came to dominate the portable computer market because TFT-LCDs consume relatively little power and had a distinct

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<sup>14</sup> Early Electronic Television, "The 1939 New York World's Fair," [http://www.earlytelevision.org/worlds\\_fair.html](http://www.earlytelevision.org/worlds_fair.html).

<sup>15</sup> Early Television Museum, "Early Color Television," <http://www.earlytelevision.org/color.html> and Mitchell Stephens, "History of Television," <http://www.nyu.edu/classes/stephens/History%20of%20Television%20page.htm>; Kathleen McGinn, "The Story of Color Television," *U.S. 1 Newspaper*, November 14, 2001, <http://161.58.97.168/200111/11114c01.html>.

<sup>16</sup> Benj Edwards, "A Brief History of Computer Displays: The Glass Teletype," *PCWorld*, November 1, 2010, [http://www.pcworld.com/article/209224/a\\_brief\\_history\\_of\\_computer\\_displays.html](http://www.pcworld.com/article/209224/a_brief_history_of_computer_displays.html).

<sup>17</sup> Benj Edwards, "A Brief History of Computer Displays: Composite Video Out," *PCWorld*, November 1, 2010, [http://www.pcworld.com/article/209224/a\\_brief\\_history\\_of\\_computer\\_displays.html](http://www.pcworld.com/article/209224/a_brief_history_of_computer_displays.html).

<sup>18</sup> PC TechGuide, "CRT Monitors," at 2, <http://www.pctechguide.com/06crtmon.htm>.

<sup>19</sup> Several other technologies have emerged, including Organic Light Emitting Diodes (OLEDs), Digital Light Processing (DLP), Field Emission Displays (FEDs) and Electronic Ink Displays. However, these were less common. See J. Gurki and L. M. Quach, "Display Technology Overview," *Lytica White Paper*, July 1, 2005, 1-37 at 33.

<sup>20</sup> Benj Edwards, "A Brief History of Computer Displays: The Early LCD Era," *PCWorld*, November 1, 2010, [http://www.pcworld.com/article/209224/a\\_brief\\_history\\_of\\_computer\\_displays.html](http://www.pcworld.com/article/209224/a_brief_history_of_computer_displays.html).

advantage in terms of size and weight.<sup>21</sup> Technological advances allowed them to be manufactured in bigger sizes and to compete with CRT televisions and desktop computer monitors as early as the 1980s, but they remained relatively expensive for many years.<sup>22</sup>

19. PDPs were also much thinner than CRT displays, at only 15-20 cm thick.<sup>23</sup> PDPs initially had an advantage over TFT-LCDs in being able to display high image-quality at large sizes.<sup>24</sup> However, PDPs were almost exclusively available in sizes above 34," consumed more power than both CRT and TFT-LCDs and had exceedingly fragile screens.<sup>25</sup>
20. Over time, as TFT-LCD technology improved and became cheaper, CRT sales began to decline.<sup>26</sup> In 2005, even as overall TV sales grew dramatically, sales of "more analog-oriented, direct-view CRT TVs" were declining.<sup>27</sup> In December 2005, Matsushita Electric Ind. Co. Ltd. announced that it would shut down two of its CRT-producing subsidiaries.<sup>28</sup> In July 2006, Panasonic Taiwan announced a plan to completely stop manufacturing CRT TVs within three years.<sup>29</sup> In the fourth quarter of 2007, shipments of TFT-LCD TVs surpassed CRT TV shipments for the first

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<sup>21</sup> Pablo Fuchs, "Scales are tilting in favour of TFT-LCDs," *Computer Dealer News*, 18(15) (August 16, 2002): 19-20.

<sup>22</sup> Pablo Fuchs, "Scales are tilting in favour of TFT-LCDs," *Computer Dealer News*, 18(15) (August 16, 2002): 19-20.

<sup>23</sup> J. Gurki and L. M. Quach, "Display Technology Overview," *Lyrica White Paper*, July 1, 2005, 1-37, 26.

<sup>24</sup> Leanne Pitchford, "Plasma Display Panels," *Coalition for Plasma Science*, 2004, 2.

<sup>25</sup> J. Gurki and L. M. Quach, "Display Technology Overview," *Lyrica White Paper*, July 1, 2005, 1-37, 26.

<sup>26</sup> See Paul Semenza "A New Chapter for the Display Market," *Information Display*, 2010, 1-2, <http://www.sidmembers.org/online/article.cfm?year=2010&issue=05&file=art8> and Pablo Fuchs, "Scales are tilting in favour of TFT-LCDs," *Computer Dealer News*, 18(15) (August 16, 2002), 19-20.

<sup>27</sup> Greg Tarr, "Manufacturers Expecting Banner TV Year," *Twice*, July 11, 2005.

<sup>28</sup> EE Times-Asia, "MTPD to stop operations of two subsidiaries," December 2, 2005, [http://www.eetasia.com/ART\\_8800398649\\_480700\\_NT\\_fdae735c.HTM](http://www.eetasia.com/ART_8800398649_480700_NT_fdae735c.HTM).

<sup>29</sup> Emily Chuang, "Panasonic Taiwan to halt CRT TV production in 2-3 years," *DigiTimes*, July 31, 2006, <http://www.digitimes.com/news/a20060731VL201.html>.

time in the history of CRTs.<sup>30</sup> In early 2008, Chunghwa Picture Tubes, Ltd. announced the shutdown of its CRT plants in mainland China.<sup>31</sup>

21. During the course of the alleged CRT price-fixing conspiracy there was another price-fixing conspiracy in the closely-related TFT-LCD industry. This price-fixing conspiracy, involving the major TFT-LCD manufacturers, was revealed in December 2006.<sup>32</sup> In October 2001, during the period in which the TFT-LCD conspiracy was admitted to be in force, Samsung, Chunghwa and LG expressed satisfaction at the “recent successful rise in TFT retail prices, believing that it could help to halt further price drops in the downturn market for tubes.”<sup>33</sup> In the effort to preserve their market position, CRT producers clearly benefited from higher TFT-LCD prices.<sup>34</sup>

#### **E. The Alleged Conspiracy’s Control over CRT Sales**

22. The Defendants and co-conspirators in this case accounted for the vast majority of CRT industry sales. As shown in Figure 4, the combined market share of the Defendants and co-conspirators from 2000-2006 was close to 90 percent. During this period, the Defendants and co-conspirators held about 80 - 100 percent of the industry’s capacity.<sup>35,36</sup>

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<sup>30</sup> Darren Murph, “Worldwide TFT-LCD TV shipments surpass CRTs for first time ever,” *Engadget*, February 19, 2008.

<sup>31</sup> EMSNow, “CPT closes CRT/CDT production lines in Mainland China,” February 6, 2008, <http://www.emsnow.com/newsarchives/archivedetails.cfm?ID=21702>.

<sup>32</sup> Reuters, “LCD price-fixing investigation grows,” December 12, 2006, [http://news.cnet.com/LCD-price-fixing-investigation-grows/2100-1047\\_3-6142839.html](http://news.cnet.com/LCD-price-fixing-investigation-grows/2100-1047_3-6142839.html); Neowin Forums, “LCD Price-Fixing Probe Widens,” December 12, 2006, <http://www.neowin.net/forum/topic/520907-lcd-price-fixing-probe-widens/>.

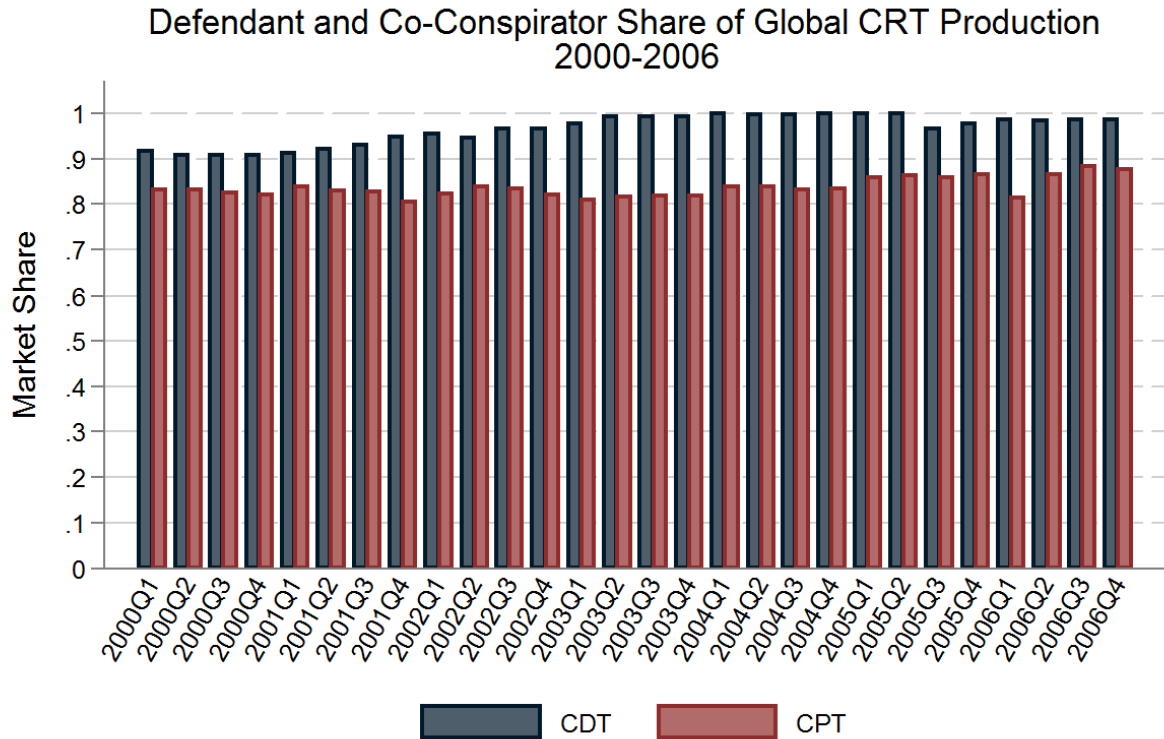
<sup>33</sup> CHU00028589.01E-CHU0028590.02E at 28589.01E.

<sup>34</sup> CHU00031174.01E-CHU00031175.02E at 1174.01E-1175.01E.

<sup>35</sup> See PHLP-CRT-014823.xls; MTPD-0575968.xls; MTPD-0468631.xls; LGE00081653.xls; BMCC-CRT000057539.xls; BMCC-CRT000006384.xls.

<sup>36</sup> Defendants’ and co-conspirators’ market share of CDT sales between 1996 and 1999 averaged 89 percent.



**Figure 4**

Source: MTPD-0416090; SDCRT-0201291; CHU00071226; CHU00154037-CHU00154420 at 154389-90; CHU00281352-CHU00281923 at 281644-45; CHWA00062147-CHWA00062569 at 62427; CHWA00088192-CHWA00088762 at 88484; CHWA00106460-CHWA00106757 at 106730.

23. This high degree of control over production and sales is significant from the standpoint of the impact of the alleged conspiracy. If the participants can collectively coordinate pricing decisions, their control over total industry output will translate that coordination into industry-wide price effects. Moreover, their high degree of control also simplifies their coordination because there is little by way of an outside competitive presence to exert pressure on the alleged conspiracy's coordination efforts.



#### IV. Irico's Role in the CRT Industry

24. Irico participated in the global market for CRTs along with other co-conspirators. Irico manufactured both CDTs and CPTs during the class period.<sup>37</sup> Irico's CRTs presented consumers with the same fundamental function and characteristics—i.e. the same ability to display an image in color—as CRTs from other conspirators and Irico presented its CRTs as being comparable to those of other CRT manufacturers. Irico sold its CRTs in various parts of the world, such as Japan, Turkey, and Egypt, as well as China. According to Irico, it sold “approximately 70 to 80%” of their CRTs in China. It shared customers and sold to the same types of customers as its co-conspirators. For example, in China, Irico sold to such customers as Konka, Skyworth, Hisense, LG and TCL<sup>38</sup> all of whom purchased CRTs from other co-conspirators as well.<sup>39</sup> In other parts of the world, Irico sold to such customers as Vestel (in Turkey), El Araby (in Egypt), and Videocon (in India),<sup>40</sup> all of whom purchased CRTs from other co-conspirators as well.<sup>41</sup> As I describe below, this global conspiracy had a widespread effect on all customers of the global market.
25. Figure 5 and Figure 6 show the breakdown of yearly global market shares of CDTs and CPTs by the conspirator manufacturers. The alleged conspiracy included four firms with high global market shares (Chunghwa, Samsung, MTPD, and LG). From a sales share perspective, Irico falls within a second group of alleged co-conspirators which includes Orion, Thai-CRT, Hitachi, and Videocon that had smaller shares of global sales. Benefits from a successful conspiracy accrue to all participants, both large and small.

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<sup>37</sup> It produced CPTs during the entire Class Period but ceased the manufacturing of CDTs in 2002. Letter from Joseph R. Tiffany II, January 15, 2009, “Response of Irico Group Corporation and Irico Display Devices Co., Ltd. To Plaintiffs’ Information Requests” at 4.

<sup>38</sup> Letter from Joseph R. Tiffany II, January 15, 2009, “Response of Irico Group Corporation and Irico Display Devices Co., Ltd. To Plaintiffs’ Information Requests” at 3; CRT Manufacturers’ Sales Data.

<sup>39</sup> CRT Manufacturers’ Sales Data.

<sup>40</sup> Letter from Joseph R. Tiffany II, January 15, 2009, “Response of Irico Group Corporation and Irico Display Devices Co., Ltd. To Plaintiffs’ Information Requests” at 2-3.

<sup>41</sup> CRT Manufacturers’ Sales Data.

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**Figure 5: Conspirators' CDT Global Market Shares**

| Manufacturer | 1996      | 1997   | 1998   | 1999   | 2000   | 2001   | 2002   | 2003   | 2004   | 2005   | 2006   |
|--------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|              | (Percent) |        |        |        |        |        |        |        |        |        |        |
|              | (1)       | (2)    | (3)    | (4)    | (5)    | (6)    | (7)    | (8)    | (9)    | (10)   | (11)   |
| CHUNGHWA     | 20.5 %    | 15.8 % | 17.9 % | 20.6 % | 20.3 % | 21.1 % | 22.8 % | 24.0 % | 23.9 % | 23.8 % | 26.3 % |
| HITACHI      | 12.7      | 13.7   | 9.3    | 5.1    | 4.5    | 2.9    |        |        |        |        |        |
| IRICO        | 0.3       | 0.0    |        | 0.8    | 0.9    |        |        |        |        |        |        |
| LPD          | 16.8      | 18.6   | 21.6   | 24.7   | 23.4   | 24.3   | 27.9   | 31.2   | 34.3   | 32.1   | 29.1   |
| MTSUBISHI    | 2.1       | 2.5    | 2.2    | 2.8    | 4.9    | 4.8    | 3.8    | 2.8    | 0.7    |        |        |
| MTPD         | 16.3      | 16.6   | 13.1   | 10.3   | 7.4    | 4.6    | 3.6    | 0.7    |        |        |        |
| ORION        | 4.5       | 5.4    | 5.9    | 5.5    | 6.4    | 6.8    | 4.5    | 4.0    | 2.1    | 1.7    |        |
| SAMSUNG      | 16.3      | 15.5   | 20.3   | 20.5   | 22.8   | 28.5   | 33.2   | 36.2   | 38.9   | 41.1   | 43.3   |
| THAI-CRT     |           |        |        |        | 0.3    |        |        |        |        |        |        |

Note: Matsushita (Panasonic) and Toshiba are combined with MTPD.

Source: SDCRT-0201291; CHU00071226; CHU00154037-CHU00154420 at 154389-90;  
CHWA00088192-CHWA00088762 at 88484; CHWA00106460-CHWA00106757 at 106730.

**Figure 6: Conspirators' CPT Global Market Shares**

| Manufacturer | 2000      | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  |
|--------------|-----------|-------|-------|-------|-------|-------|-------|
|              | (Percent) |       |       |       |       |       |       |
|              | (1)       | (2)   | (3)   | (4)   | (5)   | (6)   | (7)   |
| CHUNGHWA     | 6.1 %     | 4.4 % | 5.1 % | 5.0 % | 7.0 % | 6.3 % | 7.7 % |
| HITACHI      | 2.7       | 2.7   | 2.3   | 2.4   | 2.9   | 2.8   | 3.4   |
| IRICO        | 4.2       | 4.7   | 5.3   | 5.9   | 6.3   | 7.1   | 7.5   |
| LPD          | 23.8      | 23.5  | 24.0  | 23.0  | 21.0  | 22.9  | 21.7  |
| MTPD         | 12.7      | 13.2  | 13.1  | 12.4  | 12.1  | 11.7  | 10.4  |
| ORION        | 5.0       | 5.6   | 4.6   | 3.5   | 3.3   | 3.5   | 2.8   |
| SAMSUNG      | 15.7      | 17.4  | 18.1  | 18.5  | 19.5  | 20.6  | 21.3  |
| THAI-CRT     | 2.6       | 2.5   | 2.9   | 3.3   | 2.9   | 2.1   | 1.7   |
| VIDEOCON     | 10.1      | 8.5   | 7.7   | 7.5   | 8.6   | 9.1   | 9.5   |

Source: MTPD-0416090

**V. CRT Pricing Was Structured by Product Characteristics**

26. A simple comparison of CRT transaction prices across buyers, without accounting in any way for product differences, would naturally reveal substantial variability. Price variability is sometimes advanced as evidence that a conspiracy was ineffective in enforcing its prices or that its impact was selectively distributed across buyers.

However, price variation often just reflects factors like differences in product characteristics, seller reputation or purchase quantities that are unrelated to the impact of the conspiracy. I have analyzed the pricing data for purposes of identifying variability associated with factors of this sort. I find that the vast majority of observed pricing variability is related to these non-conspiracy factors.

27. In this regard, I conducted a series of “hedonic” regressions on actual CRT transaction prices. In essence, a hedonic regression is used to identify relationships between product prices and product, seller or customer characteristics (the “explanatory variables”).<sup>42</sup> To reflect product characteristics, I included information from the transaction data regarding the CRT’s size, whether it was widescreen, whether ITC or bare, transaction quantity, and an indicator for the brand. I performed a separate hedonic regression each calendar quarter both for CDT and CPT prices using the actual transaction prices within that quarter.<sup>43</sup>
28. One of the statistics produced by regression analysis is known as the R-Squared. In essence, it represents the percentage of the variation in the variable that is the subject of the analysis (in this case, CRT prices) that can be explained statistically by the explanatory variables (CRT product, transaction and seller characteristics). The R-Squared ranges in value from 0 to 1. Zero means the explanatory variables didn’t account for any of the variation, one means they accounted for all of it. In this context, the R-Squared reveals the percentage of the CRT customer price variation each quarter that can be explained by the product characteristics.<sup>44</sup>
29. In Figure 7 below, I plot (as a series of vertical bars over time) the R-Squared for each of the 104 quarterly regressions associated with the two types of CRTs over the

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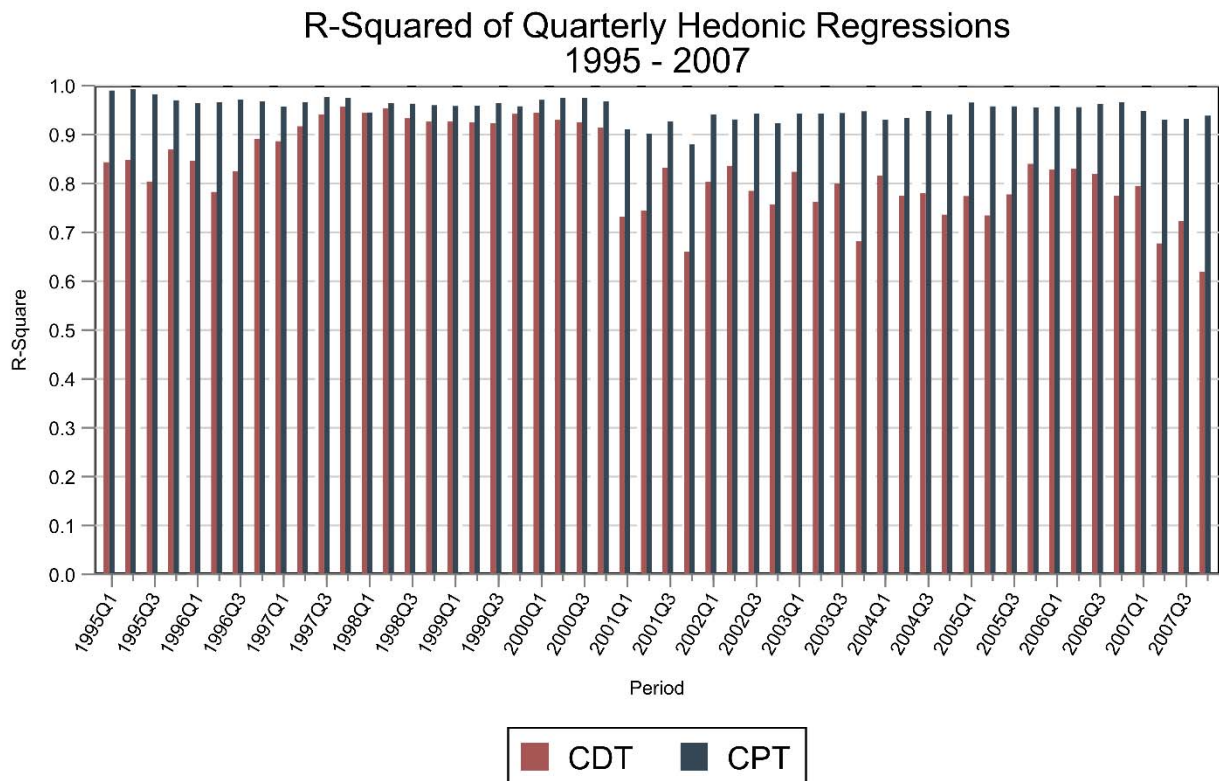
<sup>42</sup> See, e.g., S. Rosen, “Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition,” *The Journal of Political Economy*, 82-1 (1974): 34-55.

<sup>43</sup> I have estimated separate hedonic relationships for the prices and associated product characteristics within each quarter. This allows for enough data within each regression to meaningfully assess the underlying relationships while, at the same time, limiting the degree to which changes over time in the underlying hedonic relationships may confound the estimation.

<sup>44</sup> In this regard, one cannot conclude that the unexplained variation (one minus the R-Squared) is the result of the alleged conspiracy. It may reflect either the effects of the alleged conspiracy or other non-conspiratorial factors excluded from the model.

13 years covered by the analysis. The median R-squared for the CPT hedonic regressions was 96 percent and 83 percent for CDTs. The R-Squared exceeded 0.7 in all but four of the 104 results. In short, the vast majority of the variability associated with prices can be explained statistically by factors other than the conspiracy.

**Figure 7**



Note: Based on hedonic regression of Log(Gross Transaction Price) on size dummies, widescreen indicator, itc/bare, manufacturer dummies, and log(transaction volume). Hedonic Regression conducted for CDT and CPT products separately for each quarter in period 1995Q1 - 2007Q4.

Source: CRT Manufacturer's Sales Data; Hedonic Regressions.

## VI. The Alleged Conspiracy

30. In this section, I describe my understanding of the organization and operation of the conspiracy as alleged by Plaintiffs, including the manner in which the participants communicated with each other. In doing so, I describe some of the evidence developed by Plaintiffs in support of their allegations. As an economic matter, this evidence is indicative of anticompetitive activity that is broad in scope and multi-faceted in the manner in which it affects firm behavior. The scope of the conspiracy

indicated by this evidence supports my opinion that its impact would be felt broadly by CRT buyers.

### **A. Organization and Communication**

31. The overarching goal of the alleged conspiracy was to maintain and elevate CRT prices.<sup>45</sup> The collusive efforts among Defendants and co-conspirators began as early as March 1995.<sup>46</sup> Chunghwa, LG Electronics, Samsung, Philips and Orion held “group” meetings in Taiwan, South Korea, Thailand, Japan, Malaysia, Indonesia and Singapore to exchange information, and agree on CRT prices, production levels and customer allocation. Attendees of group meetings later met with non-attending co-conspirators—including Hitachi, Toshiba and Panasonic—to apprise them of information discussed and agreements reached at the group meetings.
32. From 1997 through 2006, there were hundreds of “Glass Meetings” which took place in Taiwan, South Korea, Singapore, Japan, Indonesia, Thailand and Malaysia.<sup>47</sup> These meetings had a hierarchical structure involving three levels of employees.<sup>48</sup>

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<sup>45</sup> “It can be understood that one might reduce their price in order to sell, however if the price drops too low, it will not help to increase sales, but instead cause each maker to keep cutting the price and bleed.” CHU00028396.01E-CHU00028397E at 28396.01E. See also CHU00028752.01E-CHU00028754E at 8753.01E and CHU00030787.01E-CHU00030794E at 791.02E, “In view of the market situation, July’s number of non-workdays should be higher than the average number over the April-June period, to demonstrate each maker’s commitment to safeguarding the price.”

<sup>46</sup> See Direct Purchaser Plaintiffs’ Consolidated Amended Complaint, March 16, 2009 (“Complaint”) at 2.

<sup>47</sup> See e.g., Deposition of Chih Chun-Liu Vol. 2 (Chunghwa), February 20, 2013 at 367:17-22, “Q. Did all the group meetings occur in Taiwan, sir? A. No. Q. Where did they occur? A. In Taiwan, Korea, Japan, Malaysia, Thailand, Indonesia.” See also SDCRT-0086672E-SDCRT-0086674E at 672E and Complaint, 32.

<sup>48</sup> For example, as described by one Defendant employee, “To my recollection there were top management meetings and management meetings, and there were also working level meetings.” Deposition of Jaen Lee Vol. 1 (Samsung), June 6, 2012 at 31:25-32:2. The importance of involving employees from different levels has been identified in academic literature. See, for example, Levenstein, M. and V. Suslow, “What Determines Conspiracy Success?,” *Journal of Economic Literature*, 44 (March 2006): 43-95, talking about successful conspiracies “[t]hey develop an elaborate internal hierarchy that allows communication on various levels (executive and middle-management) not only to provide flexibility in the details of the agreement, but to build trust as well.”

- i. “Top Meetings” were attended by CEOs, Presidents and Vice Presidents and typically occurred quarterly. These meetings focused on long term agreements and enforcement of the alleged conspiracy.<sup>49</sup>
  - ii. “Management Meetings” were attended by high-level sales executives with pricing authority and took place monthly.<sup>50</sup> These meetings focused on pricing and output agreements and the implementation of the agreements entered into at the Top Meetings.<sup>51</sup>
  - iii. “Working Level Meetings” were attended by marketing and lower-level sales personnel and took place weekly or monthly.<sup>52</sup> The attendees exchanged information on sales and production activities, pricing policies and other topics, then transferred this information to superior members of their company, who had pricing authority. These meetings were often held in preparation for the higher level meetings.
33. In preparation for Glass Meetings, Defendants and co-conspirators often shared information about inventories, production, sales and exports.<sup>53</sup> In the meetings themselves, Defendants and co-conspirators provided information regarding sales, capacity, production line status, pricing, and demand forecasts.<sup>54</sup> They reviewed information regarding actual market shares and discussed agreements regarding

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<sup>49</sup> See e.g., SDCRT-0086593E-SDCRT-0086596E at 6593E-6594E.

<sup>50</sup> “To my recollection, [] the management meeting was once a month.” Deposition of Jaemin Lee Vol. 1 (Samsung), June 6, 2012 at 32:24-33:1.

<sup>51</sup> See e.g., SDCRT-0086593E-SDCRT-0086596E at 6593E-6594E.

<sup>52</sup> “Management meeting was once a month, and working level meeting was so that we could prepare for the management meeting. So working level meetings were held on the same day as the management meetings or one day before the management meetings.” Deposition of Jaemin Lee Vol. 1 (Samsung), June 6, 2012 at 33:1-5.

<sup>53</sup> Deposition of Jaemin Lee Vol. 1 (Samsung), June 6, 2012. See also Complaint, 32.

<sup>54</sup> See Deposition of Jaemin Lee Vol. 1 (Samsung), June 6, 2012 at 34:1-37:13; CHU00660426-CHU00660435; SDCRT-0087934E-SDCRT-0087937E at 7936E; SDCRT-0086649E-SDCRT-0086651E; CHU00031111.01E-CHU00031112.02E; CHU00028685E-CHU00028686E; CHU00028558E; CHU00028548E; CHU00028532E; SDCRT-0006041E; Samsung SDI Defendants’ Supplemental Responses to Direct Purchaser Plaintiffs’ First Set of Interrogatories, NOS. 4 and 5, October 17, 2011 at 56, 64

market shares going forward.<sup>55</sup> They also discussed demand and supply conditions in connection with a “Market Update” for CRTs. They discussed market trends for both CRTs<sup>56</sup> and TFT-LCDs.<sup>57</sup> Suspected violations of the alleged conspiracy agreements were openly discussed among the participants, along with threats to raid the violator’s customer base.<sup>58</sup> Additionally, the conspirators jointly developed customer explanations for CRT price increases, as well as public statements on supply, capacity and demand for CRTs designed to conceal the effects of the conspiracy.<sup>59</sup>

34. There were also discussions on “How to keep the Price”<sup>60</sup> or “Price Management.” A typical meeting would end with planning for future meetings and “All Other Business”<sup>61</sup> (which often included discussions about contacting and informing manufacturers not in attendance regarding the agreements reached during the meeting). There was discussion regarding the importance of keeping the industry meetings “confidential considering the international regulation of antitrust laws.”<sup>62</sup>

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<sup>55</sup> CHU00647932-CHU00647943 at 7935 and 7941-7942; CHU00660539-CHU00660548 at 0545-0546; SDCRT-0088763-SDCRT-0088772 at 8767; SDCRT-0088846-SDCRT-0088851 at 8848.

<sup>56</sup> CHU00660383-CHU00660394 at 660386-660390.

<sup>57</sup> CHU00647932-CHU00647943 at 647937-647938.

<sup>58</sup> Deposition of Chih Chun-Liu Vol. 2 (Chunghwa), February 20, 2013 at 368:1-369:16. See also Deposition of Jaemin Lee Vol. 1 (Samsung), June 6, 2012 at 40:9-17, “Q [] Based on your attendance at these meetings, you were aware that there was an agreement regarding an auditing process for the companies to audit and check regarding the information that the competitors were providing at these glass meetings? [] A: Yes, discussions on that did occur.” See also SDCRT\_0087953E-SDCRT\_0087962E at 953; CHU00028297-CHU00028298 at 8297E; CHU00030698-CHU00030700 at 0699.01E.

<sup>59</sup> See CHU00028763E-CHU00028767E at 763E “SDD published the news about reducing production by 20% in Korean newspapers, see attached,” CHU00030701.01E-CHU00030704.02E at 30702.01E, “Mr. David indicated that recently the newspapers and media have repeatedly published information about the expected rise of CDT and Monitor prices. It is quite helpful for our CDT and Monitor makers to raise the prices even further in the future.”

<sup>60</sup> CHU00660487-CHU00660500 at 660497: 20% capacity shutdown and Weekly Quantity and Price monitoring; CHU00030701.01E-CHU00030704.02E at 30702.02E and 30704.01E.

<sup>61</sup> CHU00660487-CHU00660500 at 500; CHU00660515-CHU00660522 at 522.

<sup>62</sup> SDCRT-0086672E-SDCRT-0086674E at 86672E; CHU00647932-CHU00647943 at 7943; CHU00031176.01E-CHU00031176.02E at 31176.02E referring to the importance of keeping the meetings secret; CHU00578883.01E-CHU00578885E at 8883.01E.



35. There were regional meetings occurring simultaneously with the Glass Meetings, including monthly meetings of Chinese manufacturers to report Glass Meeting decisions. Irico, Hitachi Shenzhen, Samsung SDI Shenzhen, Samsung SDI Tianjin, and Chunghwa participated in these meetings.<sup>63</sup> There were meetings in Europe that included European manufacturers,<sup>64</sup> such as Thomson and Daewoo-Orion Societe Anonyme (DOSA). In June 2002, Thomson, DOSA, SDI, and LPD held a meeting in Rome. The participants in these meetings exchanged sales information, capacity changes, production forecasts, and market demand forecasts.<sup>65</sup> There were also meetings in the U.S. For example, In 2003 Thomson met in the U.S. with representatives of Matsushita Display Devices America (MDDA) [Panasonic] and Toshiba Display Devices America (TDDA). Thomson provided TDDA and MDDA with CPT sales and inventory information, CPT capacity and production information, and described interactions with specific customers.<sup>66</sup>
36. The conspirators also communicated plans and information by email. For example, in 2001 a Philips employee received a report by email on Thomson's production of 36 inch and 38 inch CRTs as well as SDI's current and planned production of 19/20 and 25/27 inch CRTs. The email also stated that, "Both SDI and Thomson intend to hold pricing until Q3 2001."<sup>67</sup> Another example is an email from Shinichi Iwamoto of MDDA in 2002, titled "Information Exchange with Thomson," reports

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<sup>63</sup> SDCRT-0086672E-SDCRT-0086674E at 672E.

<sup>64</sup> For example, an email from April 2003 discusses a meeting of the "Europe CPT companies" LPD, Thomson, and SDI. LPD and Thomson both discuss decreasing demand and line stoppages. See SDCRT-0006903E. See also SDCRT-0088635 (Meeting in December 2003). Also, Thomson and Samsung met at Thomson's headquarters in France and exchanged information on production and market supply of CPTs. The notes describe a price agreement between Samsung and Thomson for 20, 21, and 25 inch CPTs and list Thomson's quarter by quarter pricing plan for large-sized models in 2000. See SDCRT-0086256-7004 at 6511. On November 15, 2002, SDI met with Thomson at its headquarters and exchanged information on sales, capacity, Thomson's changing production technology for 29 inch and 32 inch CPTs, market demand for CPTs in North America, Europe, and Asia, and Thomson's cost reduction efforts. See SDCRT-0006632E-33E.

<sup>65</sup> SDCRT-0087705E-7E.

<sup>66</sup> MTPD-0576483E.

<sup>67</sup> PHLP-CRT-089918.



information on production and pricing strategies shared by Thomson.<sup>68</sup> Also, an SDI email titled “Exchange of Information on Thomson CRT” from 2003 describes capacity changes at a Thomson plant and reports Thomson said that “there will be no additional price cutting.”<sup>69</sup>

37. In addition, there were “Green Meetings,” attended by high-level management, which took place on golf courses.<sup>70</sup> Finally, there were many bilateral meetings involving various Defendants and co-conspirators to communicate agreements regarding CRT pricing and output to members of the conspiracy who were unable to attend Glass Meetings. At these meetings, sales and marketing employees exchanged information regarding sales orders, customers, pricing and production levels.<sup>71</sup>
38. Irico attended numerous meetings with other CRT manufacturers to share market information and set prices. In November 1998, Irico hosted a meeting attended by Chungwa, Philips, Samsung SDI, Orion, and BMCC to exchange sales and production data, as well as plans and forecasts for the following year.<sup>72</sup> Participants in this meeting also discussed prices including setting a “bottom line price” for Irico’s 15” CDT.<sup>73</sup> In February 1999, Irico attended a CDT manufacturer meeting with Chungwa, Philips, Samsung SDI, LG, Orion, and BMCC to exchange market information and forecasts for the coming year. Participants shared production, inventory, and sales information, as well as market demand by customer.<sup>74</sup> In April 1999, Irico attended another CDT manufacturer meeting with Chungwa, Phillips, Samsung, Orion, and BMCC. The producers again shared production, inventory, and

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<sup>68</sup> MTPD-0223790E.

<sup>69</sup> SDCRT-0007239\_CT.

<sup>70</sup> CHU00021268.01E-CHU00021271E at 268.01, Set up itinerary for 3/5 Glass Meeting and 3/6 Green Meeting; CHU00030916.01E-CHU00030916.02E at 30916.02E.

<sup>71</sup> See CHU00028968.01E-CHU00028969E; CHU00028647.01E-CHU00028647.02E; CHU00028254.01E-CHU00028256E.

<sup>72</sup> CHU00030684.01E-CHU00030687E.

<sup>73</sup> CHU00030684.01E-CHU00030687E at 686.01E.

<sup>74</sup> CHU00030705.01E-CHU00030708E.

sales information.<sup>75</sup> In this meeting there was a focus on the price of 15” CDTs and the manufacturers concluded that “15” is the main point in the future and everyone agreed to go back to the export base price of @USD 65, with Chungwa’s representative specifically writing that “IRICO agreed to cooperate, which should be the key point.”<sup>76</sup> In May 1999, Irico attended a manufacturer’s meeting where participants shared production and sales information and discussed the prices of several CDT products. They concluded that “the makers should conscientiously maintain their [] transaction prices starting May 1st” and it was noted that some manufacturers “have increased the 14” CDT price in order to bring it closer to the bottom price that had originally been set in discussions.”<sup>77</sup> A similar meeting attended by Irico in September 1999 concluded with a decision to increase price of 14” CDTs by \$2, stating that “[m]arket condition for 14” is hot, so there was no opposition to price increase.”<sup>78</sup>

39. There was also direct communication about cooperation and price setting between Irico and its co-conspirators. A 1999 document distributed to Chungwa’s Sales Department describes a phone conversation between Chungwa and one of Irico’s Vice President Wei by phone. Chungwa was requesting “IRICO could cooperate with [Chungwa] to increase the 14” CPT sales price starting July 1<sup>st</sup>,” writing that “IRICO basically agreed.”<sup>79</sup> The conversation also included discussion about IRICO’s 14” CPT production capacity and production volume. A document summarizing an August 1999 meeting that Irico attended discusses production capacity and lists domestic and export “bottom price” for 14, 15, and 17 inch CDTs<sup>80</sup>. Another Chungwa document describes a visit to Irico in 2003, where they met with Irico’s Export Sales Chief. During the meeting, Irico shared information about its

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<sup>75</sup> CHU00030745.01E-CHU00030747.02E.

<sup>76</sup> CHU00030745.01E-CHU00030747.02E at 747.02E.

<sup>77</sup> CHU00030752.01E-CHU00030755.02E at 755.01.

<sup>78</sup> CHU00030843.01E-CHU00030845.02E at 845.01E.

<sup>79</sup> CHU00030769E-CHU00030770E at 769E.

<sup>80</sup> SDCRT-0086672E-SDCRT-0086674E.

production line and production capacity, as well as its sales and profits. There were discussions on product pricing and it was concluded that “[i]n the near future, both parties wish to once more exchange views regarding CPT factory production capacities, glass supply/demand, and the 2Q market situation.”<sup>81</sup> A 2005 meeting between Irico and Samsung managers details Samsung’s Vice President’s recent visit to Irico as well as Irico’s General Manager’s previous visits to Samsung’s Shenzhen factory and its headquarters in Korea.<sup>82</sup> In this meeting, Irico’s General Manager states that “whenever competition gets fierce, it highly requires cooperation between the same businesses in the industry and between products.” He continues by stating that “sharing information between the companies in China is a very necessary activity,” in particular referring to the need to share information to improve their ability to forecast.<sup>83</sup>

40. In June 2000, Irico’s Sales President met with Chungwa sales representatives. Irico shared its business plans, including production lines and capacity by CRT product size, sales and future sale targets, inventory, and price points. Chungwa representatives were negotiating with Irico, on behalf of Philips “to maintain the price differential around \$1” for 15” CDTs.<sup>84</sup>
41. In November 2006 a “Presidents’ Meeting” that included an Irico representative had agenda items that included sharing information on the current industry conditions and forecasts of future market, and recent inventory increases.<sup>85</sup> At a manufacturer meeting in August 1999, Irico and its co-conspirators shared production and sales information for July and August 1999 and included prices 14, 15, and 17 inch CDTs for August and September.<sup>86</sup> Among the information exchanged, Irico shared that

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<sup>81</sup> CHU00030067.01E-CHU00030067.03E at 067.03E.

<sup>82</sup> SDCRT-0091524E-SDCRT-0091530E.

<sup>83</sup> SDCRT-0091524E-SDCRT-0091530E at 525E-526E.

<sup>84</sup> CHU00029110.01E-CHU00029115E.

<sup>85</sup> Irico’s representative, Xiaolin Shen, suggested they “stop production during Chinese New Year holiday period” to reduce production. CHU00102752.01E-CHU00102754.02E

<sup>86</sup> CHU00030823.01E-CHU00030826E.

they have “no plans for 17” CDT mass production in ’99, and that in the 1<sup>st</sup> HALF of ’00, the conversion from 14” CPT production will be completed.<sup>87</sup>” Similar sales, inventory, and production line information was shared in a March 2000 meeting that included Irico, Chungwa, Samsung and Philips. Production line plans for 14, 15, and 17 inch CDTs were shared by all four manufacturers at the meeting. A 2001 meeting that included Irico and several other manufacturers shared inventory information and discussed several line stoppages by its attendees. Irico shared that it is reviewing the plan to terminate production of 14” CRTs, that it stopped all production lines between April 28 and May 8, and that “25” DF has been stopped almost all the time and there are no plans to resume production.”<sup>88</sup>

42. Irico attended several other meetings that discussed production, sales, capacity, prices and costs held in October 1998,<sup>89</sup> and March,<sup>90</sup> May,<sup>91</sup> August,<sup>92</sup> and September<sup>93</sup> 2000.
43. The scope, frequency and depth (both as an informational and organizational matter) of these meetings is economically significant from the standpoint of the likely impact of the alleged conspiracy. It suggests extensive communication and coordination regarding the participants’ activities. This would facilitate close alignment among the participants with the goals of the alleged conspiracy and broad impact on prices. In addition, several market research firms published prices and revenue figures on a regular basis. DisplaySearch, iSuppli, WitsView, and DisplayBank were publicly available sources of price information for the CRT industry. The conspirators routinely tracked this information and discussed it during their meetings.<sup>94</sup> Indeed,

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<sup>87</sup> CHU00030823.01E-CHU00030826E at 823.02E.

<sup>88</sup> SDCRT-0087340E-SDCRT-0087342E.

<sup>89</sup> CHU00030679.01E-CHU00030679.02E.

<sup>90</sup> CHU00030973.01E-CHU00030975E.

<sup>91</sup> CHU00031002.01E-CHU00031004.02E.

<sup>92</sup> CHU00031040.01E-CHU00031043E.

<sup>93</sup> CHU00031044.01E-CHU00031046.

<sup>94</sup> See Deposition of Roger De Moor Vol. 1 (Philips), July 31, 2012 at 70:19-71:1, “Q. Do you know what his

one of the first points of discussion during a typical Glass Meeting was market trends and these sources were often cited.<sup>95</sup>

### **B. Collusive Activities Directed Towards Restraining Output**

44. According to Plaintiffs, the alleged conspiracy participants reached agreements regarding capacity and output. As an economic matter, there is a well-recognized relationship between prices on the one hand and output and capacity on the other.<sup>96</sup> These agreements included “line stoppage plans”<sup>97</sup> involving temporary<sup>98</sup> or, in some cases, permanent closures of production lines and reduced number of work days.<sup>99</sup> An August 1998 meeting document recorded, “agreed to reduce to 3.9 million units, reached a 25% prod. reduction... companies agreed to reduce production by further % in order to maintain the price 17 inch screens at US\$93.”<sup>100</sup> In some cases,

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responsibilities were? A. Collect information about market trends, working with DisplaySearch, and presenting to management the information on which they could base their plans.” See also the Deposition of Yun Seok Lee (LGE), July 11, 2012 at 78:8-11 and Deposition of William Allen Whalen Vol. 1 (Hitachi), August 23, 2012 at 110:24-111:13.

<sup>95</sup> CHU00014230.01E-CHU00014231.02E at 14230.01E and CHU00031111.01E-CHU00031112.02E at 31112.02E.

<sup>96</sup> See e.g., R.C. Marshall and L. M. Marx, *The Economics of Collusion*, Cambridge: The MIT Press, 2012): 118-119; C. Davidson and R. Deneckere, “Excess Capacity and Collusion,” *International Economic Review* 31- 3 (Aug., 1990): 521-541; R.W. Staiger and F. A. Wolak, “Collusive Pricing with Capacity Constraints in the Presence of Demand Uncertainty,” *The RAND Journal of Economics* 23-2 (Summer, 1992): 203-220. Note that even if conspiracy price discipline breaks down, the reduced industry output will continue to have its industry-wide price effect.

<sup>97</sup> SDCRT-0086593E-SDCRT-0086596E at 86593E at 86593E; CHU00030899.01E-CHU00030903E at 30902E; CHU00030888.01E-CHU00030893.02E at 30888.02E; CHU00030701.01E-CHU00030704.02E at 30702.02E.

<sup>98</sup> SDCRT-0086632E-SDCRT-0086633E at 6632E; CHU00030787.01E-CHU00030794E at 30787.01E and 30791.02E-30793E; CHU00031111.01E-CHU00031112.02E at 31112.02E; SDCRT-0086649E-SDCRT-0086651E at 86650E-86651E.

<sup>99</sup> See CHU00028768.01E-CHU00028770E at 28768.01E; SDCRT-0086632E-SDCRT-0086633E at 86632E; SDCRT-0086641E-SDCRT-0086645E at 86642E and 86645E; CHU00030787.01E-CHU00030794E at 30791.02E.

<sup>100</sup> SDCRT-0086419E-SDCRT-0086420E at 419E.

inspectors apparently verified line shutdowns that were part of these agreements.<sup>101</sup> In a May 1999 Glass Meeting, the conspirators employees agreed that:

17" CDT production will stop for 5 days (25 operating days) to adjust the actual production volume in order to maintain the price level.<sup>102</sup>

45. A November 2000 document recorded, “market demand in November is worse compared to October, in order to maintain the stability of pricing, a stricter control of the output volume is needed.”<sup>103</sup> In market updates and reviews later that year the conspirators noted that:

[T]his year the 17" [CDT] price has been able to be keep at a price no less than \$90 because of the glass meetings,<sup>104</sup> and

Price-up trend in European & American market thanks to capacity reduction in Asia.<sup>105</sup>

46. Other documents record production controls aimed at stabilizing prices.<sup>106</sup> For example in 2007, CPT manufacturers in China including “Panasonic Beijing, Samsung Shenzhen [SDI], Seg-Hitachi, Thomson, LG Changsha, Philips Nanjing, Shanghai

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<sup>101</sup> SDCRT-0086593E-SDCRT-0086596E at 86596E; SDCRT-0086641E-SDCRT-0086645E at 86643E; CHU00031075.01E-CHU00031087E at 75.01E; SDCRT-0091599E-SDCRT-0091604E at 1602E.

<sup>102</sup> Samsung SDI, May 1999, Report on the CDT management meeting results (May of ‘99), SDCRT-0086632E-SDCRT-0086633E at 6632E.

<sup>103</sup> CHU00031075.01E-CHU00031087E at 076.01.

<sup>104</sup> CHU00030888.01E-CHU00030893.02E at 889.01E.

<sup>105</sup> CHU00030899.01E-CHU00030903E at 902E.

<sup>106</sup> SDCRT-0086632E-SDCRT-0086633E at 86632E; SDCRT-0086419-SDCRT-0086420 at 419E; CHU00031075-CHU00031087 at 31076.01E; CHU00022696.01E-CHU00022696.02E at 22696.01E; CHU00660549-CHU00660560 at 557-559; CHU00014200-CHU00014201E at 14201E. The cartel members also exchanged production and capacity information useful for coordinating plans, e.g., CHU00028760.01E-2E at 61E-2E reports SDI, LG, Orion, Hitachi, Toshiba, Panasonic, Mitsubishi, Chunghwa, and Philips.

Yongxin [Novel], and IRICO,” announced that “the entire CRT TV [CPT] industry stopped production for 20 days.”<sup>107</sup>

47. Plaintiffs also allege that the conspiracy explicitly allocated market shares and customers. The conspirators reached agreements regarding output in the form of “Capacity Control Guideline[s]” and “M/S Allocation” (i.e. market share allocation).<sup>108</sup> One way this was done was that the alleged conspiracy divided the global CRT market as a whole by targeting specific market shares of sales for individual conspiracy members.<sup>109</sup> Additionally, they discussed allocating exclusive rights to major customers or large shares of certain major customers amongst members.<sup>110</sup> For instance, in connection with CDT customer AOC, the conspirators discussed the following:

In addition, with regard to each maker’s share with A.O.C., it was reviewed and set as follows: [Chunghwa]: 50% PH: 20% SDD/ORION: 30% (SDD and Orion will review as to how to share that 30%).<sup>111</sup>

48. In another example from a CPT meeting, conspirators discussed:

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<sup>107</sup> CHWA00226236-CHWA00226269 at 44.

<sup>108</sup> CHU0064793-CHU00647943 at 7935, 7939 and 7941-7942; CHU00608095-CHU00608105 at 608100 and 608104; SDCRT-0088846-SDCRT-0088851 at 88848-88849; SDCRT-0088763-SDCRT-0088772 at 8767. See also Deposition of Jaemin Lee Vol. 2 (Samsung), June 7, 2012 at 248:15-249:2, “And the plan for 2004 indicates the figures that each company proposed as what they would like to do. And when you get the percentage in total volume and divide by a hundred, that will be the MS here.”

<sup>109</sup> Several documents report a comparison of “Agreed” vs. “Actual” market shares. See for instance SDCRT-0088763-SDCRT-0088772 at 8767; SDCRT-0088846-SDCRT-0088851 at 8848; CHU00029259.01E-CHU00029261.02e at 9261.01E; CHU00647932-CHU00647943 at 7935.

<sup>110</sup> CHU00660561-CHU00660574 at 0569; CHU00660539-CHU00660548 at 0545-0546; SDCRT-0091687-SDCRT-0091691 at 1689E.

<sup>111</sup> CHU00030763E-CHU00030765E at 0764E-0765E.



With Thai-CRT/TEDI's promise that they would not grab Chunghwa Picture Tube's M/S orders (maintained at the original 50%).<sup>112</sup>

49. Various documents obtained through discovery in this case reference meetings at which the alleged conspirators exchanged plans and information related to CRT production.<sup>113</sup> For example, documents show that in 2003, the conspirators conducted at least 18 meetings in which they discussed various ways of reducing the current CDT production and 8 meetings discussing reduction of CPT production.<sup>114</sup> Figure 8 summarizes the number of meetings between conspirators relating to production plans and information.<sup>115</sup>

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<sup>112</sup> CHU00029259.01E-CHU00029261.02E at 9261.01E.

<sup>113</sup> Given the prospects for other meetings to have occurred which are not documented in the discovery in this case, Figure 8 likely reflects a fraction of the total communication that occurred with respect to these topics.

<sup>114</sup> Appendix B lists these documents.

<sup>115</sup> Line shutdown refers to an apparent coordination and communication by manufacturers of plans for permanent closures of entire production lines. Line reduction refers to coordination and communication of plans for some kind of reduction in the output or capacity of a line that will remain in operation (e.g., the number of days a line runs in a month). "Information Exchange" includes the sharing of information on capacity or production capabilities between firms. This category includes the exchange by manufacturers of strategic information regarding their production capabilities, capacities or existing plans for line changes and shutdowns.



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**Figure 8: Meetings Referencing Production Restraints**

| Product Type | Capacity Control Topic              | 1995     | 1996     | 1997      | 1998      | 1999      | 2000      | 2001     | 2002     | 2003      | 2004      | 2005      | 2006     | Total                |
|--------------|-------------------------------------|----------|----------|-----------|-----------|-----------|-----------|----------|----------|-----------|-----------|-----------|----------|----------------------|
|              |                                     | (1)      | (2)      | (3)       | (4)       | (5)       | (6)       | (7)      | (8)      | (9)       | (10)      | (11)      | (12)     | (1)+(2)+(12)<br>(13) |
| CDT          | Line Shutdown                       | -        | -        | -         | 1         | -         | 1         | 4        | 2        | 16        | 9         | 8         | -        | 41                   |
|              | Line Reduction                      | -        | -        | 4         | 4         | 15        | 10        | 9        | -        | 6         | 2         | 2         | -        | 52                   |
|              | Information Exchange                | -        | 4        | 7         | 8         | 17        | 8         | 4        | 6        | 7         | 2         | 5         | -        | 68                   |
|              | <b>Total Documents</b> <sup>1</sup> | <b>-</b> | <b>4</b> | <b>11</b> | <b>10</b> | <b>27</b> | <b>13</b> | <b>9</b> | <b>7</b> | <b>18</b> | <b>12</b> | <b>10</b> | <b>-</b> | <b>121</b>           |
| CPT          | Line Shutdown                       | -        | -        | -         | -         | -         | -         | 1        | -        | -         | -         | -         | -        | 1                    |
|              | Line Reduction                      | -        | -        | -         | 4         | 3         | 1         | 4        | 1        | 1         | -         | 2         | -        | 16                   |
|              | Information Exchange                | 1        | 1        | 1         | 3         | 5         | 6         | 7        | 5        | 7         | 11        | 11        | 2        | 60                   |
|              | <b>Total Documents</b> <sup>1</sup> | <b>1</b> | <b>1</b> | <b>1</b>  | <b>5</b>  | <b>7</b>  | <b>7</b>  | <b>9</b> | <b>6</b> | <b>8</b>  | <b>11</b> | <b>12</b> | <b>2</b> | <b>70</b>            |

<sup>1</sup> Total Documents refers to the total number of documents referencing capacity control in a year.

Source: Conspiracy documents.

### C. Price Targeting

50. The participants in the conspiracy agreed at various times through the meetings and other communication described above to “bottom prices,”<sup>116</sup> price increases,<sup>117</sup> price ranges,<sup>118</sup> price guidelines,<sup>119</sup> internal transfer prices,<sup>120</sup> and price differentials.<sup>121</sup> They

<sup>116</sup> For example see CHU00028768.01E-CHU00028770E at 28768.01E and 28770E, “Everyone shall persist in guarding the bottom line under a common understanding among the CDT industry...” and CHU00028725.01E-CHU00028727E at 28727E, “Guard Bottom Price. Do not lower prices to take other makers’ orders.” See also CHU00030787.01E-CHU00030794E at 30791.01 and 30793E; MTPD-0423675E-MTPD-0423677E at 423675E; SDCRT-0086416E-SDCRT-0086418E at 86416E; SDCRT-0086593E-SDCRT-0086596E at 86593; CHU00028752.01E-CHU00028754 at 28752.01E.

<sup>117</sup> SDCRT-0086593E-SDCRT-0086596E at 86593E; CHU00030787.01E-CHU00030794E at 30791.01E; MTPD-0423651E at sheet 2; CHU00660681-CHU00660692 at 689; CHU00123358E-CHU00123361.02E at 358E; CHU00031249.01E-CHU00031252E at 31249.02E; CHU00030701.01E-CHU00030704.02E at 30701.02E. See also Deposition of Jaemin Lee Vol. 2 (Samsung), June 7, 2012 at 250:14-16 “My understanding is that the companies were saying well, let’s have a discussion on raising prices.”

<sup>118</sup> CHU00028815E-CHU00028816E at 28816E; CHU00028666E-CHU00028667E at 28667E.

<sup>119</sup> CHU00036394.01E-CHU00036395.02E at 36395.01E; CHU00036408.01E-CHU00036409.02E at 36409.01E; CHU00036384.01E-CHU00036385E at 36384.02E; CHU00608095-CHU00608105 at 105; SDCRT-0087934E-SDCRT-0087937E at 7935E; CHU00031111.01E-CHU00031112.02E at 31112.01E.

<sup>120</sup> See SDCRT-0086641E-SDCRT-0086645E at 86641E, List 14” and 15” price to be applied as of August 1 with an internal price listed or gap stated; CHU0031174E-CHU00031175.02E at 31175.01E.

also established “Pricing Policy” or a “New Price Guideline” (usually in the form of price floors or bottom prices).<sup>122</sup> Specific price guidelines were sometimes set for certain customers,<sup>123</sup> along with discounts for other “Major customer[s]” (typically \$1-\$2 less than prices for “all others”).<sup>124</sup> In doing so, Defendants and co-conspirators effectively established price targets at various points in time for the top-selling CRTs. Using Glass Meeting documents (contemporaneous meeting notes and documents prepared by Defendants and co-conspirators for use during the meetings), I and my staff compiled a data set containing price targets we were able to find.<sup>125</sup> In a number of instances, possible price targets could not be used because of incomplete information regarding the meeting date or the date of effectiveness. For these reasons, as well as the gaps that routinely occur in efforts to use historical documents to reconstruct behavior, I expect that this dataset understates the full extent of price targeting.

51. The target prices that we found through this effort involved a range of CRT types and sizes that accounted for the vast majority of CRT shipments. As shown in Figure 9, the share of shipments represented by the targeted CRTs was over 98 percent for CPTs and over 90 percent for CDTs. This means that price targeting, if effective in influencing actual prices just for the targeted CRTs, would have directly impacted products accounting for about 94 percent of CRT shipments during the Class Period.

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<sup>121</sup> SDCRT-0086632E-SDCRT-0086633E at 6633E; CHU00030787.01E-CHU00030794E at 30791.01E; CHU00028725.01E-CHU00028727E at 28727E; CHU0031174E-CHU00031175.02E at 31175.01E; CHU00029144.01E-CHU00029146.02E at 29144.02E-29146.01E which lists price conversions for if the models are ITC or Bare; SDCRT-0086662E-SDCRT-0086664E at 86662E “Honestly, LG is absolutely weaker than Samsung and Chunghwa, so LG cannot compete at the same price level.”

<sup>122</sup> SDCRT-0086512E-SDCRT-0086513E at 6512E-6513E; SDCRT-0086649E-SDCRT-0086651E at 86649E.

<sup>123</sup> SDCRT-0086512E-SDCRT-0086513E at 6512E-6513E; CHU00028687E-CHU00028688E at 28688E; CHU00029144.01E-CHU00029146.02E at 29144.02E-29146.01E.

<sup>124</sup> See CHU00028725.01E-CHU00028727E at 28727E; CHU00647932-CHU000647943 at 940; SDCRT-0086416E-SDCRT-0086418E at 86416E; CHU00031240.01E-CHU00031247E at 31242E; TAEC-CRT-00089968-TAEC-CRT-00089969 at 89968.

<sup>125</sup> Where the target involved a range of prices, the minimum price was recorded. Prices that appeared simply to be the sharing of past price information were excluded. Prices for an ongoing month or quarter were included as targets when they were discussed in the first half of the month or quarter.

That result, by itself, goes a long way towards establishing the existence of broad impact on the part of the alleged conspiracy.

52. For each of the targeted products in Figure 9 below, multiple target prices were located. Generally, for a given product type and size, there were dozens of instances where a target price was agreed upon and communicated amongst the alleged conspiracy participants. The number of target prices found for CDTs ranged from 36 (for 19 inch) to 77 (for 15 inch); for CPTs, we found as few as 9 target prices (for 28 inch) and as many as 108 (for 14 inch).

**Figure 9: Targeted CRT Product Share of Shipments**

| <u>Product Type</u> | <u>Size</u>      | <u>Share of Shipments</u> |
|---------------------|------------------|---------------------------|
| (1)                 | (2)              | (Percent)<br>(3)          |
| <b>1. CDT</b>       |                  |                           |
|                     | 14               | 11.45 %                   |
|                     | 15               | 26.52                     |
|                     | 17               | 53.55                     |
|                     | 19               | 6.64                      |
|                     |                  | <hr/>                     |
|                     | <b>Total CDT</b> | <b>98.16 %</b>            |
| <b>2. CPT</b>       |                  |                           |
|                     | 14               | 18.80 %                   |
|                     | 15               | 3.95                      |
|                     | 20               | 11.80                     |
|                     | 21               | 30.60                     |
|                     | 25               | 3.40                      |
|                     | 28               | 2.14                      |
|                     | 29               | 18.02                     |
|                     | 32               | 1.49                      |
|                     |                  | <hr/>                     |
|                     | <b>Total CPT</b> | <b>90.19 %</b>            |

Note: Sales of CRT products unidentified as CDT or CPT not included.  
 "Targeted Products" are CRTs for which target prices were found.

Source: CRT Manufacturers' Sales Data; Conspiracy Documents.

## VII. The Impact of Price Targets

### A. With Respect to Targeted CRTs

53. Based upon the continuing meetings and communication among the alleged participants in the conspiracy and the attention devoted to price targets during those meetings, I would expect that the price targeting process was effective, at least to some extent, in raising prices. As an economic matter, it would be difficult to understand the continuing time and effort devoted to target prices if they operated to no avail. I have analyzed the relationship between price targets and actual sales prices.
54. First, I looked to see whether target prices and actual prices moved together—that is, whether higher than average price targets lined up with higher than average actual prices, etc. Even if they don't always match, if the price target influences actual prices, I would expect to find that these prices moved together. Economists often use correlation coefficients as a measure of the extent to which different economic variables move together. Correlation coefficients range (in absolute value) from 0 to 1. One is perfect correlation, zero indicates no correlation. I find that price targets and transaction price levels (the average transaction price for the targeted product) were highly correlated. The correlation coefficient is 0.98. Clearly, higher price targets were closely associated with higher actual prices.
55. As a second step in analyzing the relationship between target prices and transaction prices, I have employed regression analysis. For that purpose, I first calculated the quarterly shipment-weighted average actual CRT price for each customer, product type, size, and finish, for which I found a target price.<sup>126</sup> I then estimated a regression model on those quarterly average prices using the previous quarter's actual price, and price targets (both in the current quarter and in the prior quarter and represented separately for CDTs and CPTs) as explanatory variables.<sup>127</sup> I also included a set of supply and demand factors (described below as part of my estimation of the cartel's

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<sup>126</sup> In regards to my use of average quarterly prices, I note that the price guidelines were primarily set at a quarterly level.

<sup>127</sup> By including both the current price target and the price target from the prior quarter, I allow for the possibility that the full effect of the target may take some time to manifest itself in actual prices.

overcharges on sales of CRTs) likely to have influenced actual prices.<sup>128</sup> Finally, I include fixed effects for customer-product type-size-finish categories. Figure 10 reports the results of this regression. The results reveal statistically strong evidence of a positive relationship between target prices and actual prices, separate and apart from the effects of other market factors. The estimated coefficients are statistically significant at the 95 percent level.

56. In Figure 11 below, I show the results of target price regressions estimated separately for North American and non-North American sales. These results show that, with a high degree of statistical confidence, target prices developed pursuant to the conspiracy were associated with higher CRT prices both in North America and in the rest of the world.

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<sup>128</sup> Namely, the price of glass, lagged quarterly CRT shipment volume, lagged quarterly LCD share, quadratic trend, production growth and unemployment rate of countries in G7, as well as fixed effects.

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**Figure 10: The Cartel's Price Targets Elevated Actual Prices**

| Variable                              | Estimate  | Clustered <sup>9</sup> |         |         |
|---------------------------------------|-----------|------------------------|---------|---------|
|                                       |           | St. Error              | T-Value | P-Value |
| (1)                                   | (2)       | (3)                    | (4)     | (5)     |
| <i>Dependent Variable:</i>            |           |                        |         |         |
| <u>Log(Actual Price)<sup>1</sup></u>  |           |                        |         |         |
| Log Actual Price (-1)                 | 0.190 *   | 0.101                  | 1.881   | 0.063   |
| Log Target Price (-1) * CDT           | 0.719 *** | 0.102                  | 7.029   | 0.000   |
| Log Target Price (-1) * CPT           | 0.380 *** | 0.108                  | 3.533   | 0.001   |
| DLog Target Price * CDT <sup>2</sup>  | 0.653 *** | 0.079                  | 8.276   | 0.000   |
| DLog Target Price * CPT               | 0.122 **  | 0.059                  | 2.086   | 0.039   |
| Log BLS Glass Price (-1) <sup>3</sup> | 0.419     | 0.267                  | 1.568   | 0.120   |
| DLog BLS Glass Price                  | 0.177     | 0.248                  | 0.712   | 0.478   |
| Log BOK Glass Price (-1) <sup>4</sup> | 0.227 **  | 0.099                  | 2.297   | 0.023   |
| DLog BOK Glass Price                  | 0.228 *   | 0.118                  | 1.929   | 0.056   |
| Log CRT Quantity (-1)                 | 0.002     | 0.003                  | 0.884   | 0.378   |
| LCD/(LCD+CRT) Sales (-1) <sup>5</sup> | 0.245     | 0.161                  | 1.523   | 0.131   |
| LCD/(LCD+CRT) Sales (-1) <sup>2</sup> | -0.016    | 0.124                  | -0.129  | 0.898   |
| G7 Production Growth <sup>6</sup>     | -0.001    | 0.005                  | -0.129  | 0.897   |
| G7 Unemployment Rate <sup>7</sup>     | -0.014    | 0.017                  | -0.819  | 0.415   |
| Trend                                 | 0.002     | 0.001                  | 1.229   | 0.222   |
| Trend-square                          | 0.000 *** | 0.000                  | -2.970  | 0.004   |
| Constant                              | -0.403    | 1.324                  | -0.304  | 0.762   |
| Fixed Effects <sup>8</sup>            | YES       |                        |         |         |
| R-Square                              | 0.962     |                        |         |         |
| Observations                          | 5,898     |                        |         |         |

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

<sup>1</sup> Quarterly average transaction price weighted by quantity for each manufacturer, customer, product type, and size.<sup>2</sup> DLog Target Price is the difference between the Logs of the current target price and target price in the previous period.<sup>3</sup> Producer price index for machine-made pressed and blown lighting, automotive, and electronic glassware from BLS.<sup>4</sup> Producer price index of CRT glass from Bank of Korea.<sup>5</sup> Total LCD/(LCD+CRT) sales ratio by application. Extrapolated in years with missing data.<sup>6</sup> Quarterly growth rate of industrial production for G7 member countries.<sup>7</sup> Quarterly unemployment rate for G7 member countries.<sup>8</sup> Fixed effects by manufacturer-customer-product type-size (and finish) are included.<sup>9</sup> Clustered Robust Standard Errors by Manufacturer-Quarter.

Source: CRT Manufacturers' Sales Data; DisplaySearch; Bank of Korea; U.S. BLS; OECD; Conspiracy Documents.

**Figure 11: The Cartel's Price Targets Elevated Actual Prices in North America as Well as the Rest of the World**

| Variable   | Estimate  | Clustered <sup>11</sup> |         |         |
|--|-----------|-------------------------|---------|---------|
|  |           | St. Error               | T-Value | P-Value |
| (1)  | (2)       | (3)                     | (4)     | (5)     |
| <i>Dependent Variable:</i>                               |           |                         |         |         |
| <u>Log(Actual Price)<sup>1</sup></u>                     |           |                         |         |         |
| Log Actual Price (-1)                                    | 0.191 *   | 0.102                   | 1.878   | 0.063   |
| Log Target Price (-1) * CDT * North America <sup>2</sup> | 0.609 *** | 0.140                   | 4.347   | 0.000   |
| Log Target Price (-1) * CPT * North America              | 0.498 *** | 0.112                   | 4.430   | 0.000   |
| Log Target Price (-1) * CDT * ROW <sup>3</sup>           | 0.723 *** | 0.102                   | 7.074   | 0.000   |
| Log Target Price (-1) * CPT * ROW                        | 0.376 *** | 0.108                   | 3.487   | 0.001   |
| DLog Target Price * CDT * North America <sup>4</sup>     | 0.645 *** | 0.126                   | 5.117   | 0.000   |
| DLog Target Price * CPT * North America                  | 0.187 **  | 0.073                   | 2.550   | 0.012   |
| DLog Target Price * CDT * ROW                            | 0.650 *** | 0.079                   | 8.184   | 0.000   |
| DLog Target Price * CPT * ROW                            | 0.123 **  | 0.061                   | 2.016   | 0.046   |
| Log BLS Glass Price (-1) * North America <sup>5</sup>    | 0.430     | 0.267                   | 1.608   | 0.111   |
| DLog BLS Glass Price * North America                     | 0.186     | 0.248                   | 0.753   | 0.453   |
| Log BOK Glass Price (-1) * ROW <sup>6</sup>              | 0.226 **  | 0.099                   | 2.278   | 0.025   |
| DLog BOK Glass Price * ROW                               | 0.227 *   | 0.119                   | 1.912   | 0.058   |
| Log CRT Quantity (-1)                                    | 0.002     | 0.003                   | 0.857   | 0.393   |
| LCD/(LCD+CRT) Sales (-1) <sup>7</sup>                    | 0.247     | 0.162                   | 1.529   | 0.129   |
| LCD/(LCD+CRT) Sales (-1) <sup>2</sup>                    | -0.015    | 0.125                   | -0.119  | 0.905   |
| G7 Production Growth <sup>8</sup>                        | -0.001    | 0.005                   | -0.122  | 0.903   |
| G7 Unemployment Rate <sup>9</sup>                        | -0.013    | 0.017                   | -0.781  | 0.437   |
| Trend  | 0.002     | 0.001                   | 1.275   | 0.205   |
| Trend-square   | 0.000 *** | 0.000                   | -3.005  | 0.003   |
| Constant   | -0.469    | 1.324                   | -0.354  | 0.724   |
| Fixed Effects <sup>10</sup>                              | YES       |                         |         |         |
| R-Square   | 0.962     |                         |         |         |
| Observations   | 5,931     |                         |         |         |

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

<sup>1</sup> Quarterly average transaction price weighted by quantity for each manufacturer, customer, product type, and size.

<sup>2</sup> North American customers identified if bill-to-country (or ship-to-country if former missing) is U.S., Mexico, or Canada.

<sup>3</sup> Rest of World customers identified if bill-to country (or ship-to if former missing) is not North-America or is Unknown.

<sup>4</sup> DLog Target Price is the difference between the Logs of the current target price and target price in the previous period.

<sup>5</sup> Producer price index for machine-made pressed and blown lighting, automotive, and electronic glassware from BLS.

<sup>6</sup> Producer price index of CRT glass from Bank of Korea.

<sup>7</sup> Total LCD/(LCD+CRT) sales ratio by application. Extrapolated in years with missing data.

<sup>8</sup> Quarterly growth rate of industrial production for G7 member countries.

<sup>9</sup> Quarterly unemployment rate for G7 member countries.

<sup>10</sup> Fixed effects by manufacturer-customer-product type-size (and finish) are included.

<sup>11</sup> Clustered Robust Standard Errors by Manufacturer-Quarter.

Source: CRT Manufacturers' Sales Data; DisplaySearch; Bank of Korea; U.S. BLS; OECD; Conspiracy Documents.

## **B. With Respect to Other CRTs**

57. There were some CRT configurations for which I did not find price targets (representing about 7.4 percent of CPT shipments). However, the evidence presented below shows price targeting likely impacted these CRTs as well. This evidence takes two forms. First, there is qualitative evidence drawn both from the discovery taken in this case and from economic theory that lead me to expect that price targets would affect the pricing for all CRTs. Second, statistical analysis reveals a close and consistent relationship among actual prices for CRTs with price targets and prices for other CRTs.

### **1. Qualitative Evidence**

58. Most CRTs were used in a few key applications with well-understood characteristics that manufacturers readily could produce. CPTs and CDTs were manufactured using the same basic production processes. Indeed, CPTs and CDTs could be—and were—produced on the same production lines.<sup>129</sup> Product differentiation was largely a matter of size/performance metrics that each manufacturer was capable of producing. Indeed, there were standardized product specifications that all manufacturers used.<sup>130</sup>
59. A CRT production facility often produced a mix of products configured for different applications. It was possible to produce two different sizes on the same line in

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<sup>129</sup> See EIN0017699-EIN0018075 at 17729 and 17747; CHU00125257-CHU00125292 at 125264; Deposition of Jaemin Lee Vol. 1 (Samsung), June 6, 2012 at 113:8-114:3 and 115:5-16; Deposition of Chih Chun-Liu Vol. 1 (Chunghwa), February 19, 2013 at 34:1-35:2, “Q. Okay. And number 1 where it’s “CPTT”, When you manufactured both CPTs and CDTs, how many different lines of each did you have? A. Oh, it’s hard to say. Depends market: we have to modify this to this, this to that. I cannot remember. Q. Okay. So, if you had -- so depending on the market, you would adjust your lines to CPTs and CDTs; is that correct? A. Correct.”

<sup>130</sup> Deposition of Chih Chun-Liu Vol. 2 (Chunghwa), February 20, 2013 at 298:23-300:21. See also, Video Electronics Standards Association, “VESA and Industry Standards and Guidelines for Computer Display Monitor Timing (DMT), Version 1.0, Revision 11,” May 1, 2007, [ftp://ftp.cis.nctu.edu.tw/pub/csie/Software/X11/private/VeSaSpEcS/VESA\\_Document\\_Center\\_Monitor\\_Interface/DMTv1r11.pdf](ftp://ftp.cis.nctu.edu.tw/pub/csie/Software/X11/private/VeSaSpEcS/VESA_Document_Center_Monitor_Interface/DMTv1r11.pdf). The principal dimensions of product differentiation in CRTs were application, size, and resolution. Other ancillary features of the tubes included contrast ratio, brightness, flatness, and power consumption. The first three of these resemble resolution, in that more is generally better (for size there would have been some exceptions to this in certain uses). The last has the opposite hierarchy, where less is better.



tandem (one unit of one size and then, the other unit of the next size).<sup>131</sup> If a customer wanted to change certain aspects of the configuration, the production lines were flexible enough to make those changes in short order, in some cases within the same day.<sup>132</sup> Given this flexibility, price differences between CRTs of different characteristics that were not cost-related would be expected, as an economic matter, to induce changes in output in favor of the more profitable configurations, creating market pressure to re-align prices. As a result, prices across CRT configurations would be economically linked over time.

60. This created a structured pricing environment in which buyers and sellers started with base configurations and then incorporated add-ons associated with a particular customer need. This structure is reflected in the documents and deposition testimony taken in this case.<sup>133</sup> In numerous meeting documents, prices for CRTs were presented as differentials from other CRTs.<sup>134</sup> In addition, price differentials sometimes were given for specific product characteristics, for example, “[t]he current Agreed Price should be 0.28MPRII/USD150, 0.26TCO/USD160, Dot Pitch price difference remained at USD5.”<sup>135</sup> The conspirators paid attention to this structure in their efforts to inflate prices, for example, observing in one instance, “This would narrow the price difference between 15” and 17” and would in turn affect the success

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<sup>131</sup> Deposition of Jay Alan Heinecke (Toshiba), July 31, 2012 at 84:10-17; EIN0017699-EIN0018075 at 17729 and 17747. “The Company’s CRT production lines are highly flexible. Both CDT and large CPT lines,...can produce two different sizes at the same time.”

<sup>132</sup> Deposition of Jay Alan Heinecke (Toshiba), July 31, 2012 at 82:13-85:22.

<sup>133</sup> CHU00029144.01E-CHU00029146.02E at 29145.01E-29146.02E, List price conversion for if the model it ITC or Bare; CHU00029147E-CHU00029151E at 29149E-29150.01E; CHU00031111.01E-CHU00031112.02E at 31112.01E, “Each maker agreed to change the price differential between 17” regular and flat tubes to \$14;” CHU00030809.01E-CHU00030814E at 30810.01E, “the price differentials for Coating, Frequency, and Dot Pitch will be, respectively, USD 3/pc, USD2/pc, and USD 5/pc.”

<sup>134</sup> See e.g., CHU00014200.01E-CHU00014201E at 200.02; CHU00028760E-CHU00028747E.

<sup>135</sup> See CHU00030807.01E-CHU00030815.E at 808.01E.

in price hike for the 15".<sup>136</sup> The following testimony was given in the Liu deposition:<sup>137</sup>

Q: Let's assume for a moment that you were to raise the price of 15-inch color picture tubes, without changing the price of the 17-inch color picture tubes. Do you have an understanding, based upon your years of experience in the CRT business, what effect, if any, that would have on the relative mix of sales of 15-inch and 17-inch CPT tubes?

THE WITNESS: This question is not difficult. We are professionals in this industry. We are selling tubes like professionals if not experts. How could we only change the price of a 15 inches tubes [sic] without changing the prices for 17 inches of tubes? Of course, we would consider the overall market structure and the market acceptance and the reasonable cost gaps. We would certainly raise the prices at the same time.

THE WITNESS: [...] [T]he price will be an overall comprehensive consideration of all products. We would not focus only on one type of products unless the cost gaps were unreasonably different. We would not only raise the price for 15 inches without changing prices of all other items unless there is a particular situation that the purchase of 17 inches was not that strong and the purchase for 15 inches was particularly strong. Otherwise we would have an overall comprehensive consideration of the products categorically.

61. From this perspective, the coordination and limits on competition at the heart of this alleged conspiracy would be expected to have influenced prices across the product spectrum. Conspiratorial agreements regarding price targets for top-selling CRTs in

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<sup>136</sup> See CHU00030807.01E-CHU00030815E at 30807.02E.

<sup>137</sup> See Deposition of Chih Chun-Liu Vol. 2 (Chunghwa), February 20, 2013 at 296:3-298:1.

their base configuration would both 1) readily signal a corresponding set of prices for other configurations of those same CRTs and 2) affect the prices of other CRTs.

## **2. Statistical Evidence**

62. One can see the existence of this price structure through correlation coefficients over time between prices associated with pairings of top-selling CRTs. Figure 12 shows these correlation coefficients among the top selling sizes for CDTs and CPTs.<sup>138</sup> The pairwise correlation coefficients are generally above 0.9.
63. I examine price levels rather than price changes because, as a statistical matter, contemporaneous changes in prices can fail to show an existing relationship and, for example, be uncorrelated even where price levels track together very closely over time.<sup>139</sup> As discussed above, the relationship between target prices and actual prices involved much more than simple contemporaneous co-movement. Price targets exerted some of their effect on current prices with a lag (i.e. not solely in a contemporaneous fashion) and the impact of target prices on current prices also operated through the effects of those targets on CRT prices in the prior quarter, which served, in turn to influence current quarter price levels.<sup>140</sup>

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<sup>138</sup> I calculate the correlations using Fisher Matched-Model price indices. These indices are designed to measure price changes in a group of products accounting for changes in the composition of sales among the different products. In constructing this index, price changes for each CRT model were computed and averaged together based upon sales weights. See *Consumer Price Index Manual: Theory and Practice*, 2004, 4-9.

<sup>139</sup> As the Nobel committee once noted in connection with its award of the Nobel Prize in Economics, “Even if a statistical model based solely on difference terms can capture the short-run dynamics in a process, it has less to say about the long-run covariation of the variables. This is unfortunate because economic theory is often formulated in terms of levels and not differences.” Royal Swedish Academy of Sciences, “The Prize in Economics 2003 - Information for the Public.” [http://www.nobelprize.org/nobel\\_prizes/economic-sciences/laureates/2003/popular.html](http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2003/popular.html). Another recent article notes that “...by taking differences of the original level equation, one loses information that speaks to the relationship between the explanatory variables and GDP growth.” D. N. DeJong and M. Ripoll, “Tariffs and Growth: An Empirical Exploration of Contingent Relationships,” *The Review of Economics and Statistics* 88-4 (Nov. 2006): 625-640. Y.P. Mehra, “An Error-Correction Model of U.S. M2 Demand,” *Economic Review*, Federal Bank of Richmond (May/June 1991) explains that “... money demand functions estimated in first-difference form may be misspecified because such regressions ignore relationships that exist among the level variables.”

<sup>140</sup> Another problem with an analysis of price changes is that the underlying data contain quarter-to-quarter fluctuations that are solely related to measurement issues.

**Figure 12**  
**Correlations Between Prices of Major CRT Sizes**

| CDT    |        |        |        |        |
|--------|--------|--------|--------|--------|
|        | CDT 14 | CDT 15 | CDT 17 | CDT 19 |
| CDT 14 | 1      |        |        |        |
| CDT 15 | 0.988  | 1      |        |        |
| CDT 17 | 0.953  | 0.974  | 1      |        |
| CDT 19 | 0.937  | 0.872  | 0.986  | 1      |

| CPT    |        |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|        | CPT 14 | CPT 15 | CPT 20 | CPT 21 | CPT 25 | CPT 26 | CPT 29 | CPT 34 |
| CPT 14 | 1      |        |        |        |        |        |        |        |
| CPT 15 | 0.996  | 1      |        |        |        |        |        |        |
| CPT 20 | 0.982  | 0.981  | 1      |        |        |        |        |        |
| CPT 21 | 0.949  | 0.957  | 0.965  | 1      |        |        |        |        |
| CPT 25 | 0.941  | 0.942  | 0.931  | 0.930  | 1      |        |        |        |
| CPT 26 | 0.938  | 0.949  | 0.976  | 0.957  | 0.885  | 1      |        |        |
| CPT 29 | 0.952  | 0.959  | 0.978  | 0.978  | 0.917  | 0.990  | 1      |        |
| CPT 34 | 0.964  | 0.973  | 0.987  | 0.977  | 0.928  | 0.991  | 0.992  | 1      |

| CDT    | CPT    |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|        | CPT 14 | CPT 15 | CPT 20 | CPT 21 | CPT 25 | CPT 26 | CPT 29 | CPT 34 |
| CDT 14 | 0.937  | 0.949  | 0.871  | 0.923  | 0.905  | 0.783  | 0.827  | 0.886  |
| CDT 15 | 0.949  | 0.949  | 0.895  | 0.867  | 0.923  | 0.822  | 0.843  | 0.870  |
| CDT 17 | 0.958  | 0.949  | 0.912  | 0.866  | 0.928  | 0.846  | 0.853  | 0.884  |
| CDT 19 | 0.893  | 0.884  | 0.895  | 0.778  | 0.790  | 0.878  | 0.842  | 0.869  |

Note: Quarterly Fisher Price Indexes by CRT type and size.

Sizes accounting for at least 2.5% of CDT or CPT shipments respectively.

CDT sizes collectively account for around 98% of CDT shipments.

CPT sizes collectively account for around 93% of CPT shipments.

Source: CRT Manufacturers' Sales Data

64. To see the manner in which prices for non-targeted CRTs moved with prices for targeted CRTs, I looked at correlation coefficients between prices for these two groups. Figure 13 lists CRTs (by size and type) with at least \$10 million in sales for which I found no target prices. For each of those CRTs, I show the median correlation coefficient between its prices and prices paid for the targeted CRT of the same type. For 13 of the 18 CRTs shown in Figure 13 the correlation coefficients exceed 0.8. Weighted by sales dollars, the average correlation coefficient between prices for CRTs without targets and prices for a targeted CRT was 0.93.

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**Figure 13**

| Non-Targeted CRTs            | Median Correlation<br>With Targeted CRT<br>Within Type | Sales<br>(1995 - 2007) |                |
|------------------------------|--|------------------------|----------------|
|                              |  | (Dollars)              |                |
| CDT 10                       | 0.80   | \$                     | 104,602,768    |
| CDT 12                       | -0.24  |                        | 49,500,312     |
| CDT 20                       | 0.92   |                        | 645,036,224    |
| CDT 21                       | 0.94   |                        | 1,785,868,800  |
| CPT 6                        | 0.93   |                        | 55,422,588     |
| CPT 10                       | 0.88   |                        | 391,637,184    |
| CPT 16                       | 0.93   |                        | 57,417,416     |
| CPT 17                       | 0.86   |                        | 68,731,368     |
| CPT 19                       | 0.46   |                        | 177,459,008    |
| CPT 22                       | 0.89   |                        | 18,649,140     |
| CPT 24                       | 0.69   |                        | 92,738,064     |
| CPT 26                       | 0.95   |                        | 2,458,341,888  |
| CPT 33                       | 0.94   |                        | 1,253,861,760  |
| CPT 34                       | 0.97   |                        | 4,505,931,264  |
| CPT 36                       | 0.85   |                        | 1,037,642,560  |
| CPT 38                       | 0.96   |                        | 2,064,037,888  |
| CPT 39                       | -0.37  |                        | 44,923,320     |
| CPT 40                       | 0.61   |                        | 70,894,096     |
| Weighted Average             | 0.93   |                        |                |
| Total Non-Targeted CRT Sales |  | \$                     | 14,882,695,648 |
| Total Targeted CDT Sales     |  | \$                     | 36,456,328,448 |
| Total Targeted CPT Sales     |  | \$                     | 40,674,592,000 |

Note: Quarterly Fisher Price Indexes by CRT type and size.

Non-Targeted products with less than \$10 million sales omitted.

Correlation coefficients based on fewer than 7 quarters omitted.

Source: CRT Manufacturers' Sales Data;

Target Price Data from conspiracy notes.

### VIII. Global Reach of the Alleged Conspiracy

65. The CRT industry was global.<sup>141</sup> In their internal reporting and analysis of market conditions, the conspirators typically referenced global demand conditions.<sup>142</sup> The antitrust authorities here in the U.S. and abroad have all recognized the activities at issue here as a global CRT conspiracy.<sup>143</sup> My review of conspiracy meeting documents shows the conspirators were aware of regional price levels and adjusted them to keep them in line with their global pricing strategy.<sup>144</sup>
66. During the conspiracy period, the U.S. was one of the largest consumers of CRTs in the world.<sup>145</sup> Presumably then, a global price-fixing conspiracy would have impacted the U.S. and CRT prices in North America would track those elsewhere in the world. In fact, this is what I found.

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<sup>141</sup> E.g., DisplaySearch 2007, DisplaySearch Q2' 07 Quarterly Global TV Shipment and Forecast Report, SEAI-CRT-00223186.

<sup>142</sup> See e.g., CHU00028685-CHU00028686 at 686E (document recording a meeting between SDI and Chunghwa including a global CDT demand projection of 87.2 million in 1998); SDCRT-0087934-SDCRT-0087937 at 7936E (meeting report between LPD and Toshiba forecasting global demand); and CHU00030559-CHU00030562 at 0559.01E (meeting report with Chunghwa, Thai-CRT, Toshiba, SDI, and LPD reporting on global capacity and demand).

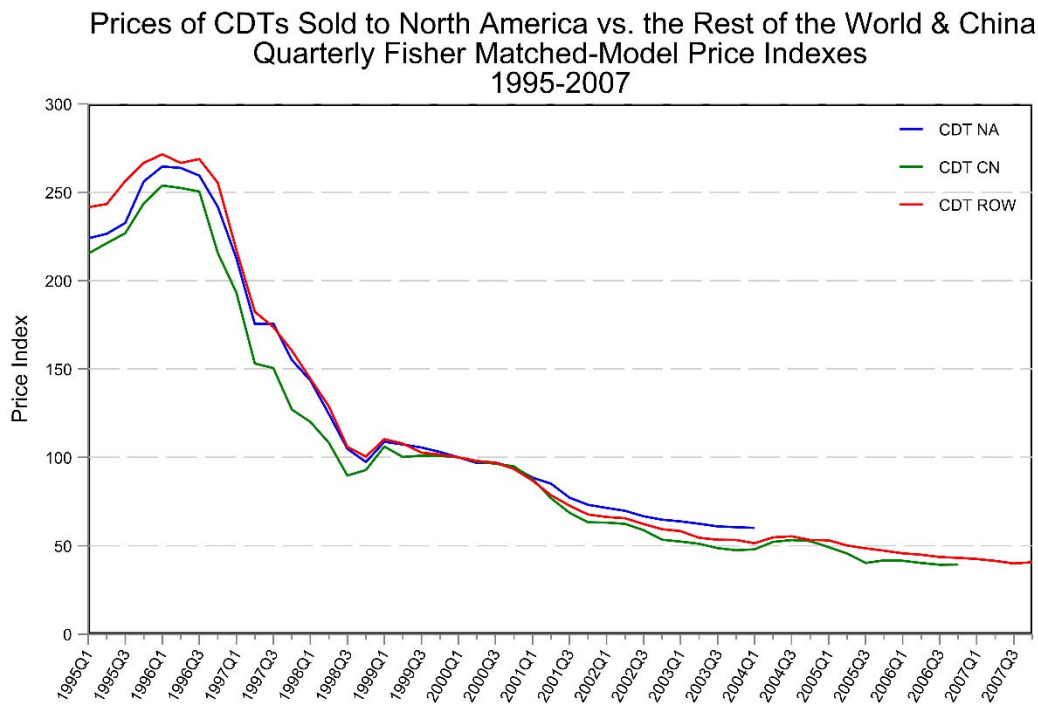
<sup>143</sup> The indictment charged “the former Chairman and Chief Executive Officer of Chunghwa Picture Tubes Ltd. for his participation in global conspiracies to fix prices of two types of cathode ray tubes (CRTs) used in computer monitors and televisions ... [and] conspiring with others to suppress and eliminate competition by fixing prices, reducing output and allocating market shares of color display tubes (CDTs) to be sold in the U.S. and elsewhere, beginning at least as early as Jan. 28, 1997, until at least as late as April 7, 2003.” *U.S. Department of Justice press release* “Former Executive Indicted for His Role in Two Cathode Ray Tube Price-Fixing Conspiracies, Global Price-fixing Scheme Involves Tubes Used in Computer Monitors and Televisions,” February 10, 2009 available at <http://www.justice.gov/opa/pr/2009/February/09-at-110.html>.

<sup>144</sup> For example, see CHU00029131.01E-CHU00029137E at 29131E: “The reasonable price in Europe will be a 116% level of S.E. Asia due to the additional cost, e.g. freight charge and import duties etc.” CHU00029138.01E-CHU00029140 at 29138.02E: “even though the price for 14” tube in Europe had dropped dramatically due to decreased demand, right now demand for 14” tubes in Europe is hot and originally the difference between the tube price in the European and Asian markets was more than \$5.0, but now that the price in Asia has risen to around ITC \$35, the price target in Europe should be increased to above \$40.”

<sup>145</sup> Defendants’ transactional CRT sales data show that approximately 18 percent of the tubes (with known bill-to-country information) were sold to the U.S. customers, which was the second largest after China. According to DisplaySearch, between 1999 and 2007, North America had the largest share for CRT monitors sold at around 30 percent.

67. In Figure 14 and Figure 15, I compare prices paid during the conspiracy by North American purchasers with prices paid by purchasers in China and other foreign locations.<sup>146</sup> Furthermore, as discussed above, Irico's sales were predominantly made to domestic Chinese manufacturers.<sup>147</sup> Hence, I compare prices paid by North American purchasers with prices paid by purchasers in China and the rest of the world separately.

**Figure 14**



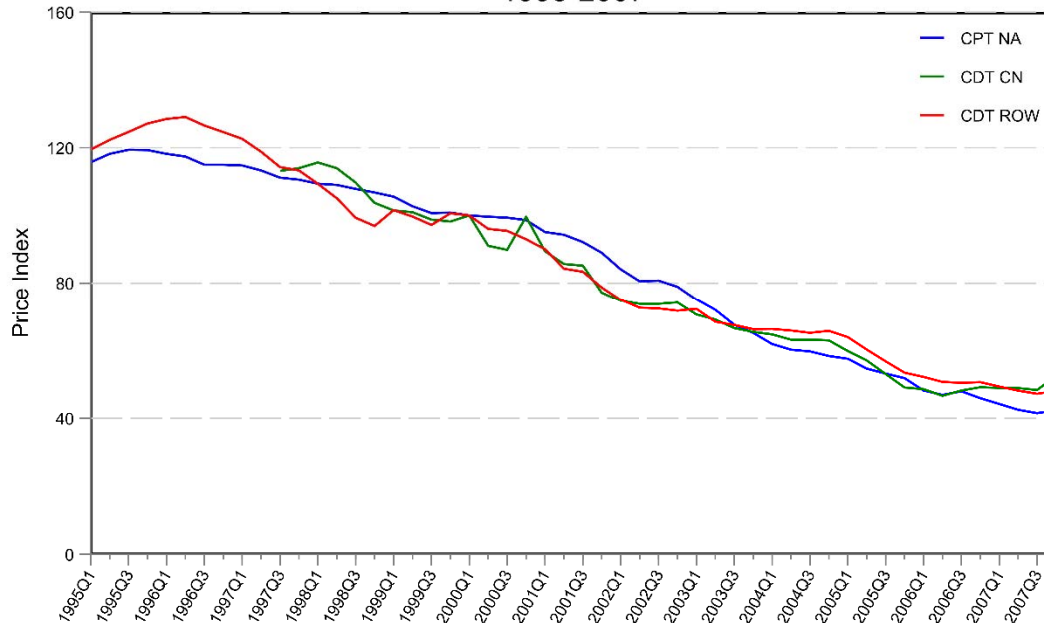
Source: CRT Manufacturers' Sales Data

<sup>146</sup> I identified sales as North American if the bill-to-country (or the ship-to-country if that is not available) is U.S., Mexico, or Canada. I note that the Defendants' data on the country of sales are missing for approximately a third of the transactions.

<sup>147</sup> Letter from Joseph R. Tiffany II, January 15, 2009, "Response of Irico Group Corporation and Irico Display Devices Co., Ltd. To Plaintiffs' Information Requests" at 3.

**Figure 15**

Prices of CPTs Sold to North America vs. the Rest of the World & China  
 Quarterly Fisher Matched-Model Price Indexes  
 1995-2007



Source: CRT Manufacturers' Sales Data

## IX. Entry Barriers

68. Economists recognize entry barriers as a factor that promotes successful maintenance of a conspiracy and, in that fashion, continuing broad impact on direct purchasers. During the Class Period, the CRT industry was characterized by large initial investments that could not readily be salvaged by exiting the industry and substantial excess capacity. Typical costs to set up a new CRT plant were between \$100-300 million.<sup>148</sup> For example, in 1996, Daewoo invested \$150 million to build a CRT factory located in the northeastern province of France<sup>149</sup> and LG Electronics built a

<sup>148</sup> See SDCRT-0068880-SDCRT-0069081 at 8922, CPT factories are estimated to “cost between \$70- and \$332 million and take up two years to build” and the Deposition of Tatsuo Tobinaga (Panasonic), July 16, 2012 at 146:8-10 and 151:15-152:11. The cost for a manufacturing facility for a standard large product line was approximately 10 billion yen, or 120-130 million US dollars.

<sup>149</sup> Korea Economic Daily, “Daewoo Electronics to Build a \$150 Mil. CRT Plant in France,” February 8, 1996.



plant in Korea, for the production of 24 – 32 inch CRTs, which cost \$125 million to build and was expected to produce 1 million CRTs per year.<sup>150</sup> A new CRT plant also involved a significant time commitment. Time from start of building to a functional plant could be up to two years.<sup>151</sup> Additional investment in a plant was often necessary and expanding plant capacity was expensive.<sup>152</sup> Once incurred, most of this investment was sunk, meaning that very little could be recovered if the manufacturer decided to exit the business. There was little use for the factories outside of CRT production<sup>153</sup> and sale of the machinery and other equipment was difficult.<sup>154</sup>

69. This created pressure to maintain high levels of capacity utilization.

A new CPT plant was estimated by producers to cost \$70- to \$332 million and take up to two years to build. Merely to increase capacity by adding current lines was estimated to cost up to \$160 million and take up to two years to complete. Once established, furthermore, it is difficult to be profitable, at least initially, due to what the staff report cites as ‘the need to operate plants at relatively high levels of capacity utilization.’ And it’s

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<sup>150</sup> Telecompaper, “LG Electronics to Invest in CRT Plant,” September 6, 1995, <http://www.telecompaper.com/news/lg-electronics-to-invest-in-crt-plant>, accessed March 22, 2012.

<sup>151</sup> Deposition of Tatsuo Tobinaga (Panasonic), July 16, 2012 at 146:11-147:8; SDCRT-0068880-SDCRT-0069081 at 8922.

<sup>152</sup> PHLP-CRT-051982-PHLP-CRT-052085 at 52078; EIN0017699-EIN0018075 at 17842; PR Newswire, “Zenith Breaks Ground For Expansion of Melrose Park Color Picture Tube Plant,” March 13, 1996, <http://www.thefreelibrary.com/ZENITH+BREAKS+GROUND+FOR+EXPANSION+OF+MELROSE+PARK+COLOR+PICTURE+TUBE...-a018086464>; PR Newswire, “Matsushita and Toshiba to Launch North American Operations of New CRT Joint Venture - New Company to Become Leading Large- Screen CRT Manufacturer in N. America,” March 28, 2003, <http://www.thefreelibrary.com/Matsushita+and+Toshiba+to+Launch+North+American+Operations+of+New+CRT...-a0131732577>.

<sup>153</sup> See Deposition of Nobuhiko Kobayashi (Hitachi), July 17, 2012 at 93:7-25. “Q: Do you know whether CRT production facilities can be used for manufacturing anything other than CRTs? A: Based on my understanding, that’s not possible.”

<sup>154</sup> See Deposition of Tatsuo Tobinaga (Panasonic), July 16, 2012 at 149:6-8. “Q:[] did you ever sell any equipment to third parties? A: We tried that, but it wasn’t successful.”

not even ‘relatively’; it’s high levels of capital utilization to be profitable.<sup>155</sup>

70. However, this was an especially daunting prospect inasmuch as the CRT industry exhibited substantial excess capacity for most of the class period. By Toshiba’s calculations, CDT capacity equaled output in 1995, and thereafter exceeded output--by as much as 35 percent in 1999.<sup>156</sup> Excess capacity in industries with high fixed costs (such as this one) can lead to dramatic price reductions under competitive conditions. That prospect can be a deterrent to would-be entrants.<sup>157</sup>
71. Together, these conditions created entry barriers. Entry barriers promote widespread impact because they discourage new competitors (that might otherwise be attracted by inflated prices) who could de-stabilize the conspiracy or create pockets of competitive pricing.<sup>158</sup> As one analyst described the industry:

The global CRT market is led primarily by Asian players. High entry costs and relatively low margins have deterred new players from entering the industry.<sup>159</sup>

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<sup>155</sup> Pat Magrath of Georgetown Economic Services speaking before the United States International Trade Commission, February 17, 2000, United States International Trade Commission, In the Matter of: Color Picture Tubes from Canada, Japan, Korea, and Singapore, SDCRT-0068880-SDCRT-0069081 at 8922.

<sup>156</sup> TAEC-CRT-00065484.

<sup>157</sup> See F. M. Scherer and D. Ross, *Industrial Market Structure and Economic Performance* (Boston: Houghton Mifflin Company, 1990): 288 - 289.

<sup>158</sup> “The easier entry into an industry (the lower entry barriers) the more difficult to sustain collusive prices. [ ] Overall, therefore, one should expect that the lower entry barriers (as determined by fixed entry costs that new firms would have to sink into the industry) the more difficult it will be to sustain collusion.” Massimo Motta, *Competition Policy: Theory and Practice* (Cambridge: Cambridge University Press, 2004).

<sup>159</sup> PHLP-CRT-051982-PHLP-CRT-052085 at 2067.

## X. Class-Wide Overcharges

### A. CRT Overcharge Estimation Method

72. One method of examining the effect of a price-fixing conspiracy, widely recognized in the economic literature,<sup>160</sup> is to compare pricing during the period in which the conspiracy operated, to pricing before and (or) after.<sup>161</sup> This is commonly referred to as a “before/after” analysis. There are various methods of comparison that can be employed in before/after analysis. A simple comparison of price levels between periods in which the conspiracy operated with levels in which it did not operate may show the impact of the conspiracy. However, in many instances, controlling for other market factors that impact prices, in addition to the conspiracy, may be necessary. When that is the case, a method is needed to isolate the effects of the conspiracy.
73. One such method is to employ regression analysis to simultaneously estimate the market relationships between prices, market demand and supply variables and the presence of the conspiracy. In essence, this kind of regression analysis provides an estimate of the impact of the alleged conspiracy on prices that is isolated from the effects of other supply/demand factors. Regression analysis of this sort (often referred to as “reduced form” models or modeling) is widely employed by economists.<sup>162</sup>

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<sup>160</sup> For a review of well-established methods of economic analysis used to estimate damages in price-fixing litigation see: J. M. Connor, “Forensic economics: an introduction with special emphasis on price fixing,” *Journal of Competition Law and Economics* 4.1 (2008): 31-59 and P. Davis and E. Garcés, *Quantitative techniques for competition and antitrust analysis* (Princeton: University Press, 2009): 347-381. See also D. L. Rubinfeld, “Antitrust Damages,” *Research Handbook on the Economics of Antitrust Law*, Einer Elhauge editor, November 21, 2009.

<sup>161</sup> In some cases, data may not be available for periods of time either before or after the alleged conspiracy that are completely free from its effects. However, the available data may allow one to compare periods in which the alleged conspiracy was fully effective with periods in which it was only partially so, in which case one can estimate a lower bound on the overcharges created by the alleged conspiracy.

<sup>162</sup> See e.g., J. F. Nieberding, “Estimating Overcharges In Antitrust Cases Using A Reduced-Form Approach: Methods and Issues,” *Journal of Applied Economics*, IX- 2 (Nov 2006): 361-380; H. H. Chouinard, and J. M. Perloff, “Gasoline Price Differences: Taxes, Pollution Regulation, Mergers, Market Power, and Market Conditions,” *The B.E. Journal of Economic Analysis & Policy*, 7-1 (Jan 2007): 1-26.

74. I understand there is evidence that suggests that the effectiveness of the alleged conspiracy may have decreased after Q1 2006. The last management level CDT meeting apparently occurred in March of 2006.<sup>163</sup> The last documented price target applied to Q4 2006.<sup>164</sup> The last of the documented meetings relating to production and capacity was also in 2006.<sup>165</sup> The CPT Glass Meetings did not occur during the period between March of 2006 and September 5, 2006.<sup>166</sup> A CPT Glass Meeting did occur in Thailand as late as February of 2007.<sup>167</sup> One was scheduled to occur in early April of 2007, but there is no evidence that it took place.
75. Based on these facts, I have been instructed to assume that the alleged conspiracy ceased effective operations as of Q1 2007. As a matter of economics, it would not be surprising to find that the aftermath of the alleged conspiracy had some continuing, albeit reduced, effect on prices through the end of the year while the competitive process was being fully restored. However, by using a “dynamic” regression model that allows for persistence in the effects of the conspiracy, Q2 through Q4 of 2007 still can be used as a post-conspiracy period.
76. The transaction data produced by the Defendants and co-conspirators spans the time period from 1992Q1 to 2011Q1. The prices that I used in this analysis are quarterly average prices created from that transactional data. These data reflect global CRT sales by ten of the Defendants and co-conspirators: Chunghwa, Hitachi, LG Electronics, LG Philips Display, Mitsubishi, Panasonic, Philips, Samsung, Thomson, and Toshiba.<sup>168</sup> Each observation in the quarterly dataset is the quantity-weighted

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<sup>163</sup> Korean Fair Trade Commission Multi-Party Meeting Decision Report, No. 2011-019 (March 10, 2011): 24, 150 and 165.

<sup>164</sup> See CHU00030449E-CHU00030457E at 451.01E (Although this document indicates there was a target price, the price itself was ambiguous in the document; thus I excluded it from the target price analyses above.)

<sup>165</sup> I was able to locate two such documents for 2006 meetings – one that occurred in March 2006 (CHU00102752E) and another that occurred in November 2006 (MTPD-0580821).

<sup>166</sup> Testimony of S.J. Yang before the Japan Fair Trade Commission, April 8-9, 2008, 17; MTPD-0479714E.

<sup>167</sup> CHU00442517-CHU00442518; CHU00100529-CHU00100530.

<sup>168</sup> I understand that Irico is in the process of compiling a transactional dataset of its historical CRT sales. To date, Irico has not produced this dataset. If these data are produced in the future, I reserve the right to review and update my analysis as needed.

average price for a manufacturer's CRT model.<sup>169</sup> I have treated the periods before Q2 1995 and after Q1 2007 as non-conspiracy periods. I have treated Q2 1995 through Q2 2006 as a period during which the alleged conspiracy was in full force and effect. I have treated Q3 2006-Q1 2007 as a second conspiracy period. I have interacted both of these conspiracy indicators with indicators for CDT and CPT to estimate separate conspiracy effects for the two CRT types.

77. There is reason to believe that there was persistence in CRT prices, which is to say a current quarter's prices reflected not just that quarter's economic conditions, but also CRT prices from the prior quarter. To allow for this possibility, I included the previous quarter's prices as an explanatory variable for prices in the current quarter.<sup>170</sup> I also included lagged CRT sales and lagged growth in CRT sales to reflect other supply-side effects, such as economies of scale in production or demand side effects, such as diminishing popularity. I included growth in industrial production and unemployment rate for the G7 countries to capture the effect of general economic activity levels and business cycles on demand for CRTs.<sup>171</sup> I also included a variable to account for the effects of competition from LCD technology.<sup>172</sup> Since Defendants and co-conspirators did not provide usable cost data, I included proxy variables to account for changes in production costs. Glass is a primary raw material in the

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<sup>169</sup> This quarterly average price is found by dividing total revenue by total quantity of shipments for a particular model-manufacturer combination. Transaction data are aggregated to a quarterly level because the data for several of the variables included in the regression analysis are only available on a quarterly basis.

<sup>170</sup> The inclusion of lagged prices implies that in calculating overcharges from the estimated coefficients, I have to account for the effect of the alleged conspiracy on the lagged prices in addition to its immediate effect. See e.g., Nieberding, J. F., "Estimating Overcharges In Antitrust Cases Using A Reduced-Form Approach: Methods and Issues," *Journal of Applied Economics* IX-2 (Nov 2006): 361-380.

<sup>171</sup> I estimate the regression model with the variables identified above (other than the conspiracy indicator and LCD share) expressed in logarithmic form because of the economic plausibility associated with the reduced form relationships specified in this fashion. In this form, the estimated coefficients can be understood to reflect the percentage change in the dependant variable that is brought about by a one percent change in the associated explanatory variable.

<sup>172</sup> I used a measure of LCD sales share relative to the LCD and CRT display market by application, extrapolated in the period when the data are missing (pre-1999 for Monitors and pre-2004 for TVs). I estimate a separate coefficient of this variable for CDTs and CPTs.

production of CRTs.<sup>173</sup> Hence, I include a BLS price index for machine blown and pressed glass<sup>174</sup> as well as a CRT glass price index from Bank of Korea<sup>175</sup> along with the growth in these indices relative to the previous quarter.

78. Figure 16 shows the regression results. As expected, the coefficient on the cost variable is positive indicating that prices rise with costs. The coefficient for LCD shipments is negative, indicating as expected that the growing popularity of LCDs exerted downward pressure on CRT prices. The estimated coefficients for the conspiracy indicators are positive (and highly significant as a statistical matter), indicating that the conspiracy elevated CRT prices.<sup>176</sup> The demand and supply factors included in this model explain almost all of the variability in CRT prices (the estimated equation has an R-Squared of 0.98).

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<sup>173</sup> “The major upstream industry for color television picture tubes is glass for CRTs. With a trend toward larger picture tubes, glass represents a growing percentage of the value of materials, currently around 60 percent, up from 30 percent just a few years ago.” John Kitzmiller, *Industry and Trade Summary Television Picture Tubes and Other Cathode-Ray Tubes*, (USITC Publication 2877, 1995): 4.

<sup>174</sup> The U.S. Department of Labor, Bureau of Labor Statistics’ Producer Price Index for “Machine-made pressed and blown lighting, automotive, and electronic glassware.”

<sup>175</sup> The Bank of Korea, Economic Statistics System, CPT Producer Price Index, [http://ecos.bok.or.kr/EIndex\\_en.jsp](http://ecos.bok.or.kr/EIndex_en.jsp).

<sup>176</sup> Because of the prospect that there are common elements in CRT pricing across models for a given manufacturer in a given quarter, with variability across models largely the result of the differences in configurations (as per the hedonic analysis described above), I have utilized a method for calculating standard errors that essentially treats the experience across all models sold by a given manufacturer within a given quarter as a single observation. This method, which produces what are known as “cluster-robust standard errors” (see A. Colin Cameron and Pravin K. Trivedi, *Microeconometrics Using Stata* (Texas: Stata Press, 2010): 84-85), does not change the regression coefficient estimates but does result in more conservative measures of statistical strength (i.e., larger standard errors and lower t-statistics).

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**Figure 16: CRT Overcharge Regression**

| Variable                                    | Coefficient | Clustered<br>Std.-Error <sup>9</sup> | T-value | P-value |
|---|-------------|--------------------------------------|---------|---------|
| (1)   | (2)         | (3)                                  | (4)     | (5)     |
| <i>Dependant Variable</i>                   |             |                                      |         |         |
| <u>Log(CRT Price)<sup>1</sup></u>           |             |                                      |         |         |
| Conspiracy Indicator 1 * CDT <sup>2a</sup>  | 0.0728 ***  | 0.025                                | 2.962   | 0.003   |
| Conspiracy Indicator 1 * CPT                | 0.0410 **   | 0.018                                | 2.321   | 0.021   |
| Conspiracy Indicator 2 * CDT <sup>2b</sup>  | 0.0264 *    | 0.016                                | 1.689   | 0.092   |
| Conspiracy Indicator 2 * CPT                | 0.0583 ***  | 0.012                                | 4.707   | 0.000   |
| Log CRT Price (-1)                          | 0.2838 ***  | 0.058                                | 4.889   | 0.000   |
| Log CRT Quantity (-1)                       | -0.0060 *** | 0.001                                | -4.368  | 0.000   |
| Dlog CRT Quantity (-1)                      | 0.0062 ***  | 0.001                                | 6.677   | 0.000   |
| Log BLS Glass Price (-1) <sup>3</sup>       | 0.2238 **   | 0.105                                | 2.140   | 0.033   |
| Dlog BLS Glass Price                        | 0.0609      | 0.134                                | 0.455   | 0.649   |
| Log BOK Glass Price (-1) <sup>4</sup>       | 0.2630 ***  | 0.056                                | 4.667   | 0.000   |
| Dlog BOK Glass Price                        | 0.3278 ***  | 0.083                                | 3.961   | 0.000   |
| LCD/(LCD+CRT) Sales (-1) * CDT <sup>5</sup> | -0.3691 *** | 0.141                                | -2.622  | 0.009   |
| LCD/(LCD+CRT) Sales (-1) * CPT              | -0.7427 *** | 0.121                                | -6.158  | 0.000   |
| LCD/(LCD+CRT) Sales (-1) <sup>2</sup> * CDT | -0.1443     | 0.140                                | -1.029  | 0.304   |
| LCD/(LCD+CRT) Sales (-1) <sup>2</sup> * CPT | 0.2103 ***  | 0.081                                | 2.597   | 0.010   |
| G7 Industrial Growth <sup>6</sup>           | 0.0033      | 0.003                                | 1.122   | 0.262   |
| G7 Unemployment Rate <sup>7</sup>           | -0.0537 *** | 0.010                                | -5.203  | 0.000   |
| Trend                                       | -0.0035 *** | 0.001                                | -3.447  | 0.001   |
| Trend-squared                               | 0.0003 ***  | 0.000                                | 5.278   | 0.000   |
| Constant                                    | 3.0155 ***  | 0.580                                | 5.202   | 0.000   |
| Fixed Effects <sup>8</sup>                  | YES         |                                      |         |         |
| Observations                                | 27,666      |                                      |         |         |
| R-squared                                   | 0.976       |                                      |         |         |

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

<sup>1</sup> Quarterly average transaction price weighted by quantity for each application-size-manufacturer-model code.<sup>2a</sup> Conspiracy Indicator takes the value one from 1995Q2-2006Q2.<sup>2b</sup> Conspiracy Indicator takes the value one from 2006Q3-2007Q1.<sup>3</sup> Producer price index for machine-made pressed and blown lighting, automotive, and electronic glassware from BLS.<sup>4</sup> Producer price index of CRT glass from Bank of Korea.<sup>5</sup> Total LCD/(LCD + CRT) sales ratio by application. Extrapolated in years with missing data.<sup>6</sup> Quarterly Growth Rate of Industrial Production for G7 member countries.<sup>7</sup> Quarterly Unemployment Rate for G7 member countries.<sup>8</sup> Fixed effects by application-size-manufacturer-model code are included.<sup>9</sup> Cluster Robust Standard Errors by Manufacturer-Quarter.

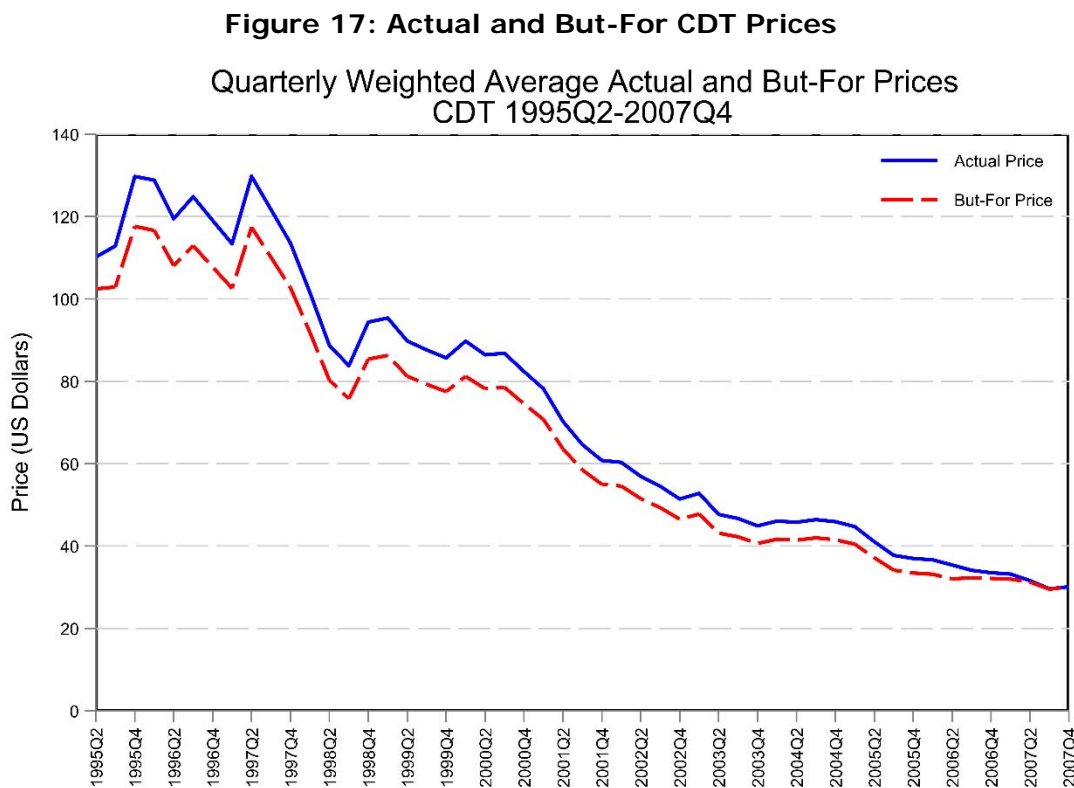
Source: CRT Manufacturers' Sales Data; DisplaySearch; Bank of Korea; U.S. BLS; OECD



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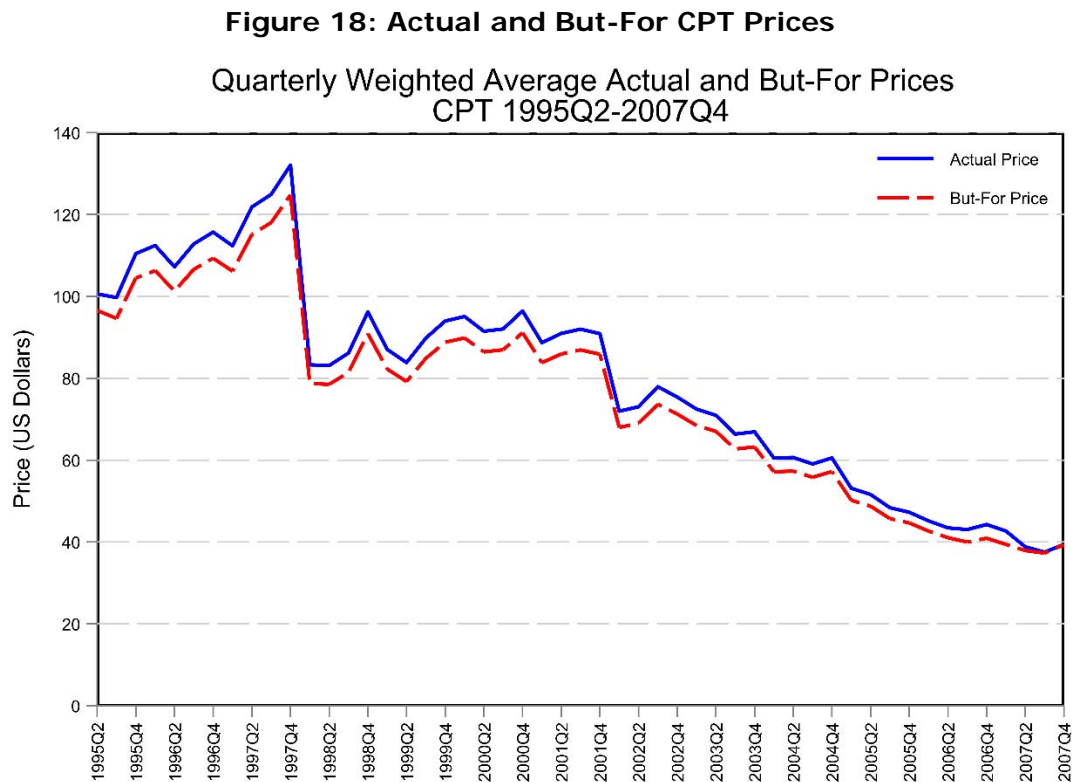
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79. The regression model of overcharges can be used to estimate the CRT prices that would have prevailed absent the conspiracy. Figure 17 and Figure 18 below show comparisons of average actual prices for CDTs and CPTs with the estimated but-for prices.



Source: CRT Manufacturers' Sales Data; Overcharge Regressions.





Source: CRT Manufacturers' Sales Data; Overcharge Regressions.

80. The conspiracy effect estimated with this model grew during the initial quarters following the instigation of the alleged conspiracy and then declines towards the end of the alleged conspiracy period used in this estimate. Those percentages range from 0.1 percent to 10.5 percent for CDTs and from 0.2 percent to 8.3 percent for CPTs. The overcharges estimated by this model continue beyond the end of the period during which the alleged conspiracy was active to the end of 2007.

### **B. The Overcharge Model Provides Further Evidence that All Customers were Harmed by the Conspiracy**

81. The evidence I have discussed above supports a conclusion that the alleged conspiracy elevated global market prices and that the impact on class members was widespread. The overcharge regression model can also be used to address questions of the breadth of impact from the conspiracy.
82. Using customers with sufficient purchases during and before and/or after the alleged cartel, I can conduct an additional statistical analysis of the breadth of impact. To this

end, I adapt the overcharge regression model by estimating a series of regressions, each of which includes additional variables for a single customer.<sup>177</sup> For example, in one regression I include the conspiracy period variables and the interaction of those conspiracy variables with customer ACER (Conspiracy Period 1 \* CDT \* ACER, etc.). The interaction variable allows the regression to check whether the data for a specific customer tends to suggest an absence of impact on that customer's purchases, despite the impact estimated on other customers. I perform separate regressions with interactions for each standardized customer name.

83. As an econometric matter, estimating the interaction variable between the conspiracy period and a customer requires the customer to have sufficient sales data during and outside of the conspiracy period. Because not all customers have sufficient sales both during and outside of the conspiracy period, the interaction variables cannot be estimated for all customers. Specifically, the regression is able to estimate coefficients for 81 non-conspirator customers which account for approximately 87% of non-conspirator purchases during the Class Period ("analyzed class period sales").<sup>178</sup>
84. Figure 19 summarizes the result of this analysis. The statistical analysis finds the data supports that impact was experienced broadly for each product type, for each of the two conduct periods. Additional evidence of impact is indicated for customers accounting for the vast majority of purchases, i.e., on purchases in the first part of the Conspiracy Period for customers accounting for nearly 100% of analyzed CDT Class Period sales and nearly 99% of analyzed CPT Class Period sales and on purchases in

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<sup>177</sup> The customer name is the bill-to name in the transactional data, where available, and the ship-to name, where the bill-to name is not available. To conduct this analysis customer names in the dataset had to be standardized and parented. There is a total of over 3,000 customer names (including various spellings, abbreviations, and subsidiaries of the same parent entity). Part of these customer names, which account for 87% of total sales, were standardized and parented to 349 customers. The remaining customer names each had less than 0.1% of sales. These customers were combined into a single customer group ("Other Customers"). Limiting the data to CDT/CPT transactions with known screen size and model code, and removing price outliers leaves 333 standardized customers still accounting for 87% of all sales. Including "Other Customers", there is a total of 334 standardized customer names. In the current analysis, I analyze all customers (worldwide) irrespective of the location.

<sup>178</sup> This includes the group "Other Customers" which is an aggregation of all unstandardized customers.

the second part of the Conspiracy Period for over 99% of the analyzed CDT Class Period sales and 100% analyzed CPT Class Period sales.

85. Further when looking whether there is statistical evidence of impact for a customer in at least one of the period for either CDT or CPT, the analysis finds support for impact on customers accounting for nearly 100% of analyzed Class Period sales. A customer may purchase a CDT or CPT in Conspiracy Period 1 and/or Conspiracy Period 2. Thus, for each customer, there are up to four places where statistical evidence for impact may be located. Accordingly, I computed the share of sales associated with customers who were impacted on either CDT or CPT in either Conspiracy Period 1 or Conspiracy Period 2.

**Figure 19: Customer-Specific Analysis Supports Common Impact**



86. This analysis consists of 81 separate regressions where the customer interaction was estimated. When conducting multiple analyses, such as here, variations in the data can be expected to produce anomalous results in some cases. Further, the data for many customers are limited and do not allow for precise identification of impact on a

customer-specific basis. For example, there are customers with relatively little purchases outside of the conspiracy period and there are many customers who don't have purchases both before and after the conspiracy period. In such settings, some anomalous and imprecise estimations (i.e., the absence of conventional statistical significance) are to be expected and are consistent with a true common effect across all customers. Accordingly, neither the individual estimates nor their statistical significance (or its absence<sup>179</sup>) should be used to assess one customer's impact without weighing the results in conjunction with the other analyses I have conducted here, i.e. documents relating to impact of the alleged conspiracy and its breadth, as well as economic frameworks (discussed above) that support my conclusion that there would be market-wide impact from the conspiracy of the type alleged here. The import of the analysis here is that the data are strongly supportive of very broad, indeed universal, impact across the class.

### C. Class-Wide CRT Damages

87. To calculate class-wide damages on CRT purchases, I can apply the overcharge percentages estimated above to the total value of Class purchases. I understand that the conspirators' sales data are likely incomplete<sup>180</sup> and lacking complete information on the sales destination (i.e. whether it was shipped or billed to the U.S.). Nonetheless, class sales can be reasonably estimated using the available manufacturers' data and other industry data.

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<sup>179</sup> Several prominent econometricians, as well as scientists in other fields such as biological sciences, have commented on the lack of an objective basis for the use of strict thresholds for statistical significance. Nobel Laureate William Kruskal argues that the commonly used five percent threshold is arbitrary and not always appropriate. See William H. Kruskal, "Significance, Tests of," *International Encyclopedia of Statistics* (1978). See also Peter Kennedy, *A Guide to Econometrics*, 6th edition (Wiley-Blackwell, 2008), 60, "[t]here is no good reason why 5% should be preferred to some other percentage." The American Statistical Association (ASA) has recently taken a formal position critiquing the pervasive use of arbitrary thresholds, i.e., conventional statistical significance thresholds. See Ronald L. Wasserstein and Nicole A. Lazar, "The ASA Statement on p-Values: Context, Process, and Purpose," *The American Statistician* 70:2 (2016), 129-133. See also See Valentin Amrhein, Sander Greenland, and Black McShane, "Scientists Rise Up Against Statistical Significance," *Nature* 567, March 20, 2019, 305-307.

<sup>180</sup> For example, Irico and some co-conspirators (Hitachi, Orion, Thai-CRT) have not produced their sales data.

88. Specifically, I can use the CRT Manufacturers' sales data and industry data to calculate the total annual value of sales to Class Members who purchased CRTs directly from them during the Class Period.<sup>181</sup> The class-wide damages can then be easily calculated for CDTs and CPTs in each year by applying the overcharge percent from the regression model.

## **XI. Overcharges for CRT Finished Products Purchased From Defendants and Co-Conspirators**

89. I understand that the court has ruled that purchasers of CRT finished products from Defendants and co-conspirators may seek to recover CRT overcharges embedded in the costs of those finished products. In this section, I discuss economic and statistical evidence linking CRT finished product prices with CRT overcharges.

### **A. Documentary Evidence Regarding CRT/CRT Product Price Relationships**

90. Generally speaking, economics would lead one to expect that higher CRT prices would be reflected in higher prices for products that incorporate CRTs. First, of course, basic market economics involve a direct relationship between market prices and market supply costs. More than that, CRT producers who were conspiring to raise prices for their CRTs as a means for increasing the profits from that business would undermine that purpose by selling finished products including CRTs that did not embody the overcharge.
91. Conspirator documents reflect an understanding of this issue. For instance, a Chunghwa document discussing recently agreed upon price hikes for CRTs states that, "[W]e should also inform the customers of a possible second stage of price hike, so that they can take time to pass on to OEM customers."<sup>182</sup> Meeting notes regarding a meeting between Chunghwa, Samsung, LG Electronics, and Orion state under

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<sup>181</sup> Industry sales data, such as from Display Search, can be used to obtain total sales of conspirators that did not produce complete data during the Class Period (e.g. MTPD-0416090; SDCRT-0201292).

<sup>182</sup> Chunghwa Picture Tubes, Ltd., March 25, 2004, Return-from-Abroad Trip Report, CHU00031240.01E-CHU00031247E at 1242E.

“CDT price increase topic” that, “CPT indicated that the \$2 price increase this time was to facilitate monitor makers’ transfer of the CDT increase to customers.”<sup>183</sup>

92. In addition, the trade press regularly discussed tube prices and their impact on finished products. A DisplaySearch report summarizes it as follows:

To calculate the CRT TV price, we used the previous quarter’s tube prices to determine the current quarter’s CRT TV street prices due to the lag between tube shipment and TV shipment. Thus, tube price reductions are reflected in street prices one quarter later.<sup>184</sup>

93. Notes from a meeting between Samsung, LG Electronics, Orion, Philips, and Chunghwa state that:

Conclusion: Mr. David indicated that recently the newspapers and media have repeatedly published information about the expected rise of CDT and Monitor prices. It is quite helpful for our CDT and Monitor makers to raise the prices even further in the future.<sup>185</sup>

94. A report of a June 23, 1999 meeting attended by Samsung, Orion, LG Electronics and Philips states, “CPT - President Lin indicated that raising the price on 15” not only benefits 15” CDT makers, but also gives Monitor makers the opportunity to adjust the price to create some profit margin for their no-profit-base business...”<sup>186</sup>

### **B. Statistical Analysis of CRT Prices and Finished Product Prices**

95. The CRT is the most costly input used in making CRT monitors and TVs, accounting for 45 to 50 percent of the cost of manufacturing the finished product and up to 70%

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<sup>183</sup> CHU00031183.01E-CHU00031185E at 1184.02E.

<sup>184</sup> DisplaySearch, March 12, 2006, Quarterly TV Cost & Price Forecast Model & Report, SDCRT-0002283-SDCRT-0002362 at 2290.

<sup>185</sup> CHU00030701.01E-CHU00030704.02E at 702.01E.

<sup>186</sup> CHU00030787.01E-CHU00030794E at 791.01E.

of the cost of materials.<sup>187</sup> I have conducted a regression analysis to examine the statistical relationship between CRT prices and CRT product prices. I again use a reduced form model of CRT prices. The pricing data used in this analysis is similar to that employed in the overcharge regression described above. The dependent variable in the regression is the quarterly volume-weighted average of the finished product prices for a particular type and size.

96. As explanatory variables, I have included measures of CRT prices, one for CDTs and one for CPTs. For those variables, I used the average price for CRTs sold during the previous quarter that were of the size<sup>188</sup> and type used for the finished products in question. As additional explanatory variables, I included share of LCD in the display market for each type, G7 industrial production growth and the unemployment rate. For CDT products, I included growth in desktop PC shipments. For CPT products, I included a producer price index for TV tuners.
97. Figure 20 presents the results of this analysis. The relationship between CRT prices and CRT finished product prices is reflected in the coefficient associated with the CRT price variables. The coefficients indicate that increases in CRT prices resulted in increases in finished product prices both for CDTs and CPTs. For CDTs, a one percent price increase was associated, on average, with a 0.71 percent increase in the finished product price. For CPTs, a one percent increase in price was associated, on average, with a 0.78 percent increase in the finished product price. For example, if a \$100 CDT increased in price to \$101 (i.e. 1 percent), a \$150 Monitor containing that tube would be expected to increase in price by \$1.07 (i.e. 0.71 percent of the \$150 finished product price). If a \$100 CPT increased in price to \$101, a \$200 TV

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<sup>187</sup> Hitachi testified that CRTs account for approximately 45% to 50% of the manufacturing cost of finished monitors or TVs; see Deposition of Yasu Hisa Takeda Vol. 1 (Hitachi), July 12, 2012 at 11:21-12:24. LGE testified that CRTs accounted for between 60%-70% of the total component cost of CRT TVs; see Deposition of Yun Seok Lee (LG Electronics), July 11, 2012 at 72:14-18.

<sup>188</sup> TV screen sizes appear to be one inch smaller than the tubes used in them for smaller TV sizes and up to two inches smaller for larger TV sizes. Accordingly, I adjusted TV sizes to match with tubes one size up for TVs less than 27 inch and two sizes up for those larger than 27 inches.

containing that tube would be expected to increase in price by \$1.56 (i.e. 0.78 percent of the \$200).<sup>189</sup>

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<sup>189</sup> This analysis utilizes costs differences across time and across product types to identify the relationship between CRT costs and CRT finished product prices. By incorporating fixed effects in the regression model the relationship can be estimated using solely intertemporal changes in price. Although there may be other cost factors that vary with size besides the CRT price, such an approach is inferior because it greatly reduces the data with which to identify the pass-through relationship. However, as a check I estimated a version of this model that included fixed effects by application and size. Those results confirm that there is a positive and statistically significant pass-through relationship for both TV and monitor tubes.



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**Figure 20: CRT Finished Product Regression**

| Variable  | Coefficient | Clustered<br>Std. Error <sup>8</sup> | T-value | P-value |
|---|-------------|--------------------------------------|---------|---------|
|   | (1)         | (2)                                  | (3)     | (4)     |
| <i>Dependant Variable</i>                                 |             |                                      |         |         |
| <u>Log(CRT Finished Product Price)<sup>1</sup></u>        |             |                                      |         |         |
| Log CDT Tube Price (-1) * Monitor Indicator <sup>2</sup>  | 0.705 ***   | 0.034                                | 20.789  | 0.000   |
| Log CPT Tube Price (-1) * TV Indicator <sup>2</sup>       | 0.775 ***   | 0.016                                | 47.296  | 0.000   |
| LCD/(LCD+CRT) Sales (-1) * Monitor Indicator <sup>3</sup> | -0.685 *    | 0.414                                | -1.656  | 0.098   |
| LCD/(LCD+CRT) Sales (-1) * TV Indicator                   | 2.186 ***   | 0.838                                | 2.608   | 0.009   |
| LCD/(LCD+CRT) Sales (-1) ^ 2 * Monitor Indicator          | 1.858 ***   | 0.663                                | 2.800   | 0.005   |
| LCD/(LCD+CRT) Sales (-1) ^ 2 * TV Indicator               | -1.702 **   | 0.663                                | -2.566  | 0.010   |
| DLog Desktop Shipments x Monitor Indicator <sup>4</sup>   | 0.048       | 0.217                                | 0.223   | 0.824   |
| Log TV Tuner PPI x TV Indicator <sup>5</sup>              | -0.026      | 0.034                                | -0.784  | 0.433   |
| G7 Industrial Growth <sup>6</sup>                         | 0.002       | 0.015                                | 0.124   | 0.901   |
| G7 Unemployment Rate <sup>7</sup>                         | 0.033       | 0.052                                | 0.635   | 0.525   |
| Trend   | -0.011 **   | 0.005                                | -2.395  | 0.017   |
| Trend ^ 2   | -0.001 **   | 0.000                                | -2.406  | 0.016   |
| Constant  | 1.944 ***   | 0.267                                | 7.288   | 0.000   |
| Observations  | 886         |                                      |         |         |
| R-squared   | 0.767       |                                      |         |         |

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level.

<sup>1</sup> Quarterly average transaction price weighted by quantity for each application and size.

<sup>2</sup> Quarterly average transaction price of ITC tubes weighted by quantity for each application and size; matched with finished product prices based on application and same size for monitors; one size up for TVs less than 27 inch and two sizes up for larger TVs.

<sup>3</sup> Total LCD/(LCD + CRT) sales ratio by application. Extrapolated in years with missing data.

<sup>4</sup> Growth in Desktop PC World Wide Shipments interacted with an indicator for CDT.

<sup>5</sup> Quarterly Production Price Index for TV Tuners interacted with an indicator for CPT.

<sup>6</sup> Quarterly Growth Rate of Industrial Production for G7 member countries.

<sup>7</sup> Quarterly Unemployment Rate for G7 member countries.

<sup>8</sup> Standard Errors adjusted for dusterling at the application-size and quarter level.


Source: CRT Manufacturers' Sales Data; DisplaySearch; Bank of Korea; U.S. BLS; OECD

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**C. Class-Wide CRT Finished Product Damages**

98. I understand that the measure of damages on CRT finished product purchasers is the amount of the overcharge on the CRTs they contain. To calculate the CRT finished product damages, I can apply the overcharges on CRTs to the value of CRT finished product sales to class members.<sup>190</sup> Specifically, first, I can compute the average annual dollar overcharge associated with the corresponding CRT (by type), by applying the overcharge percentages derived above to the CRT price. I can then multiply this average per-unit dollar amount of overcharge by the corresponding units of CRT finished product sales to the Class Members.<sup>191</sup> Adding those totals across products over time, I can obtain total overcharges for CRT products.



Phillip M. Johnson, Ph.D.  
November 19, 2021

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<sup>190</sup> As with the CRT sales data, I understand some conspirators did not produce complete data for their entire sales of CRT finished products during the Class Period. However, class sales and damages can still be reasonably calculated using the available data from conspirators and industry data. For example, Hitachi, Orion, and Thomson did not produce their finished product sales records. However, industry data can be used to obtain their total sales during the class period (see e.g., DISP\_LCD\_000129).

<sup>191</sup> Formulaically: *CRT Finished Product Overcharge* = (*CRT Overcharge Percentage* \* *CRT Price* \* *CRT Finished Products Quantity Sold*).

## APPENDIX A. CRT Manufacturers

99. **Chunghwa Entities:** Chunghwa Picture Tubes, Ltd., or “Chunghwa PT,” was established in 1971<sup>192</sup> by the Tatung Corporation and at one point was the largest domestic Taiwanese CRT manufacturing company.<sup>193</sup> Chunghwa Picture Tubes (Malaysia), or “Chunghwa Malaysia,” is a Malaysian subsidiary of Chunghwa PT.<sup>194</sup>
100. **Orion Entities:** Orion Electric Company, owned by the Daewoo group, was one of Korea’s largest CRT manufactures until Daewoo filed for bankruptcy in 2004.<sup>195</sup> In 1995 approximately 85% of its one billion dollar sales was in color picture tubes and color display tubes.<sup>196</sup> Orion Electric was involved in many joint-ventures including a joint-venture with Daewoo Electronics in French CRT manufacturer Daewoo-Orion Société Anonyme, or “DOSA.”<sup>197</sup> Daewoo International Corporation, or “Daewoo International,” is a Korean corporation<sup>198</sup> that manufactured CRT Products. Daewoo Electronics Corporation, formerly Daewoo Electronics Company, or “Daewoo Electronics” is a South Korean subsidiary of Daewoo International<sup>199</sup> and part of the

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<sup>192</sup> See Chunghwa Picture Tubes, Ltd., “Company Profile,” 2006, [http://www.cptt.com.tw/cptt/english/index.php?option=com\\_content&task=view&id=13&Itemid=32](http://www.cptt.com.tw/cptt/english/index.php?option=com_content&task=view&id=13&Itemid=32).

<sup>193</sup> M. Pecht and C.S. Lee, “Flat Panel Displays: What’s Going on in East Asia Outside Japan,” 2 and 16, <http://www.calce.umd.edu/general/AsianElectronics/Articles/DISPLAY.htm>.

<sup>194</sup> Chunghwa Picture Tubes, Ltd. and Subsidiaries, “Consolidated Financial Statements for the Six-Month Periods Ended June 30, 2005 and 2006 with Review Report of Independent Auditors (Unaudited),” August 21, 2006, 9, [http://www.cptt.com.tw/cptt/chinese/backend/files/CPTQRen\\_06Q2con.pdf](http://www.cptt.com.tw/cptt/chinese/backend/files/CPTQRen_06Q2con.pdf).

<sup>195</sup> Bailey Somers, “Daewoo Granted Chapter 15 Protection,” Law360, October 23, 2006, <http://www.law360.com/articles/12214/daewoo-granted-chapter-15-protection>.

<sup>196</sup> M. Pecht and C. S. Lee, “Flat Panel Displays: What’s Going on in East Asia Outside Japan,” 7, <http://www.calce.umd.edu/general/AsianElectronics/Articles/DISPLAY.htm>.

<sup>197</sup> M. Pecht and C. S. Lee, “Flat Panel Displays: What’s Going on in East Asia Outside Japan,” 7, <http://www.calce.umd.edu/general/AsianElectronics/Articles/DISPLAY.htm>.

<sup>198</sup> Daewoo, “Overview,” <http://www.daewoo.com/english/company/overview.jsp>.

<sup>199</sup> Daewoo International Corporation, “Electronic Industry Division,” [http://www.daewoo.com/english/business/electronics.jsp?nav=2\\_2\\_4](http://www.daewoo.com/english/business/electronics.jsp?nav=2_2_4) and Daewoo International Corporation, “Electronic Industry Division Team and Item,” [http://www.daewoo.com/english/online/brand/item.jsp?d\\_id=11](http://www.daewoo.com/english/online/brand/item.jsp?d_id=11).

Daewoo Group.<sup>200</sup> Daewoo Electronics, along with its subsidiaries and affiliates, manufactured and sold both CRTs and CRT Products.<sup>201</sup> In December 1995, Daewoo, along with Toshiba Corporation and other entities, formed P.T. Tosummit Electronic Devices Indonesia, or “TEDI,” an Indonesian CRT manufacturer.<sup>202</sup>

101. **Hitachi Entities:** Hitachi, Ltd. is the Japanese parent company for Hitachi brand CRT Products.<sup>203</sup> Hitachi Displays was a Japanese subsidiary of Hitachi, Ltd. and formerly part of “Mobara Works of Hitachi, Ltd.,” that manufactured CRT Products.<sup>204</sup> Hitachi America, Ltd. is an American subsidiary of Hitachi, Ltd. that sold and distributed CRT Products.<sup>205</sup> Hitachi Electronic Devices (USA), or “HEDUS,” is an American subsidiary of Hitachi, Ltd. that manufactured CRT Products.<sup>206</sup> Hitachi Asia, Ltd., or “Hitachi Asia” is a Singaporean subsidiary of Hitachi that manufactured CRT Products.<sup>207</sup> Shenzhen SEG Hitachi Color Display Devices, Ltd., or “Hitachi Shenzhen,” is a Chinese subsidiary of Hitachi, Ltd. that manufactured, sold and distributed CRT Products.<sup>208</sup>

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<sup>200</sup> Also includes Daewoo Electronics, Daewoo Telecom Company, Daewoo Corporation and Orion Electric Components Company.

<sup>201</sup> M. Pecht and C. S. Lee, “Flat Panel Displays: What’s Going on in East Asia Outside Japan,” 7, <http://www.calce.umd.edu/general/AsianElectronics/Articles/DISPLAY.htm>.

<sup>202</sup> Toshiba, “Toshiba’s Joint Venture in Indonesia Starts Manufacturing Color Picture Tubes for TVs,” June 24, 1996, [http://www.toshiba.co.jp/about/press/1996\\_06/pr2401.htm](http://www.toshiba.co.jp/about/press/1996_06/pr2401.htm); Toshiba, “Toshiba Establishes Joint Venture in Indonesia to Manufacture and Market TV Color Picture Tubes,” March 10, 1995, [http://www.toshiba.co.jp/about/press/1995\\_03/pr1001.htm](http://www.toshiba.co.jp/about/press/1995_03/pr1001.htm).

<sup>203</sup> Hitachi Displays, “History: from 1991 to Today,” [http://www.hitachi-displays.com/en/company/history/2012176\\_18547.html](http://www.hitachi-displays.com/en/company/history/2012176_18547.html).

<sup>204</sup> Hitachi Displays, “History: from 1991 to Today,” [http://www.hitachi-displays.com/en/company/history/2012176\\_18547.html](http://www.hitachi-displays.com/en/company/history/2012176_18547.html).

<sup>205</sup> Hitachi in U.S.A., “Legacy Products,” <http://www.hitachi.us/products/legacy/>.

<sup>206</sup> Hitachi America, Ltd., “Products and Services: Consumer Electronics,” <http://www.hitachi-america.us/>.

<sup>207</sup> Hitachi, “Hitachi in Singapore,” <http://www.hitachi.com.sg/about/hitachi/index.html>. Hitachi, “Hitachi to Withdraw from CRTs for PC Monitors,” July 26, 2001, <http://www.hitachi.com/New/cnews/E/2001/0726b/>.

<sup>208</sup> Chinabidding.com, “Hitachi Subsidiary Sets Up Shenzhen Office,” March 02, 2006, <http://www.chinabidding.com/news.jhtml?method=detail&channelId=277&docId=528867>; Businessweek,

102. **Irico Entities:** Irico Group Corporation or “IGC” is a Chinese company that manufactured and sold CRTs through its related entities, Irico Group Electronics Co., Ltd., or “IGE,” and Irico Display Devices Co., Ltd., or “IDDC.”<sup>209</sup> IGE was a subsidiary of IGC and was engaged in the manufacture, distribution, and sales of CRTs during the Class Period.<sup>210</sup> IGC has an ownership interest in IDDC. IGC is a 100 percent state-owned enterprise.<sup>211</sup> IGC’s main business, as of 2012, was oriented to “the R&D and manufacture of the display device and its components, optoelectronic complete set and related components.”<sup>212</sup>
103. **LG Electronics Entities:** LG Electronics, Inc., or “LGE” a South Korean entity, is a leading global manufacturer of consumer electronics products including televisions, computers and home appliances. LGE also produces and sells CPTs and CDTs.<sup>213</sup> In 2001 LGEI partnered<sup>214</sup> 50/50 with Koninklijke Philips Electronics N.V. to create LG Philips Displays, “LPD,” which encompassed both founders’ CRT production and sales activities.<sup>215</sup> LG Philips Displays became the independent company LP

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“Company Overview of Shenzhen SEG Hitachi Color Display Devices Co., Ltd.,”  
<http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=38948436>.

<sup>209</sup> Irico Group Corporation, “About Irico,” 4,  
<http://www.ch.com.cn/english/txt.jsp?urltype=tree.TreeTempUrl&wbtreeid=1459>.

<sup>210</sup> Complaint at 8.

<sup>211</sup> IRICO Group New Energy Company Ltd., “Placing of H Shares,” August 17, 2020, 13,  
<https://www1.hkexnews.hk/listedco/listconews/sehk/2020/0818/2020081800015.pdf>.

<sup>212</sup> Irico Group Corporation, “About Irico,” 3,  
<http://www.ch.com.cn/english/txt.jsp?urltype=tree.TreeTempUrl&wbtreeid=1459>.

<sup>213</sup> PHLP-CRT-051982-PHP-CRT-052085 at 52055-56.

<sup>214</sup> PHLP-CRT-051982-PHP-CRT-052085 at 51998; A.A.M. Deterink, “Trustee’s First Report in the bankruptcy of LG.Philips Displays Holding B.V. and LG.Philips Displays Netherlands B.V.,” March 1, 2006, 6-8,  
[http://deterinklive.com/nl/download/?file=workspace/uploads/faillissementsverslagen/lg\\_verslag1en\\_01032006.pdf](http://deterinklive.com/nl/download/?file=workspace/uploads/faillissementsverslagen/lg_verslag1en_01032006.pdf).

<sup>215</sup> PHLP-CRT-051982-PHP-CRT-052085 at 51998 and 52008-52009; Businessweek, “Company Overview of LG Philips Displays Korea Co., Ltd.,”  
<http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=6453976>.

Displays International, Ltd. on April 1, 2007.<sup>216</sup> LGE manufactured, sold and distributed CRTs and CRT Products, independently and through subsidiaries LG Electronics USA, or “LGEUSA,” LG Electronics Taiwan Taipei Co., Ltd., or “LGETT,” LP Displays International, Ltd., or “LP Displays.”

104. **Panasonic Entities:** Panasonic Corporation, known as Matsushita Electric Industrial Co, Ltd., or “MEI,” until 2008,<sup>217</sup> is a Japanese entity most known for its Panasonic brand.<sup>218</sup> It is also the primary owner of the CRT manufacturing company MT Picture Display Co., Ltd., or “MTPD,” which began in 2003 as a joint venture with Toshiba Corporation, but which MEI purchased entirely in 2007.<sup>219</sup> MEI sold and distributed CRT Products as well as CRTs.<sup>220</sup> Matsushita Electronics Corporation (Malaysia) Sdn Bhd., or “Matsushita Malaysia,” is a Malaysian subsidiary of MTPD, that sold and distributed MEI-manufactured CRT Products.<sup>221</sup> Panasonic Corporation of North America, or “PCNA,” is an American subsidiary of Panasonic Corporation that sold and distributed CRT Products.<sup>222</sup> Panasonic Consumer Electronics Co., or “PACEC,” is an American division<sup>223</sup> of PCNA that sold and distributed CRT Products.<sup>224</sup>

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<sup>216</sup> Businessweek, “Company Overview of LP Displays,” <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=1492342>; Tarr, Greg, “CRT Maker LG. Philips Displays Changes Names,” *Twice*, March 16, 2007, <http://www.twice.com/news/crt-maker-lgphilips-displays-changes-name-0>.

<sup>217</sup> Matsushita Electric Industrial Co., Ltd., “Form 6-K,” June 02, 2008, 4.

<sup>218</sup> Panasonic, “Matsushita Electric (Panasonic) and TCL Holdings Sign Collaborative Agreement on Consumer Electronics,” April 9, 2002, <http://panasonic.net/ir/relevant/en020409-4/en020409-4.html>.

<sup>219</sup> SEC, “Panasonic Corporation: Form 20-F,” March 31, 2011, 25, [http://www.sec.gov/Archives/edgar/data/63271/000119312511178201/d20f.htm#rom123323\\_46](http://www.sec.gov/Archives/edgar/data/63271/000119312511178201/d20f.htm#rom123323_46); Toshiba, “Closure of MT Picture Display (M) Sdn. Bhd.,” IR News, July 26, 2006, <http://www.toshiba.co.jp/about/ir/en/news/20060726.htm>.

<sup>220</sup> See CHU00028441.01E-CHU00028446E at 28444E and 28446E.

<sup>221</sup> Toshiba, “Closure of MT Picture Display (M) Sdn. Bhd.,” IR News, July 26, 2006, <http://www.toshiba.co.jp/about/ir/en/news/20060726.htm>.

<sup>222</sup> Panasonic USA, “Company Profile,” <http://www.panasonic.com/about/overview.asp>.

<sup>223</sup> Businessweek, “Company Overview of Panasonic Consumer Electronics Company,”



105. **Philips Entities:** Koninklijke Philips Electronics N.V., or “Royal Philips,” is a Dutch electronics company, and co-owner<sup>225</sup> of LPD with LG Electronics, as described above. Royal Philips manufactured CRT Products before the joint venture with LG Electronics with CPT sales accounting for a majority of total CRT revenue.<sup>226</sup> Subsidiaries of Royal Philips that manufactured, sold and distributed CRT Products include Philips Electronics Industries Ltd., or “PEIL,” Philips Electronics North America, or “Philips America,” Philips Consumer Electronics Co., or “PCEC,” Philips Electronics Industries (Taiwan), Ltd., or “Philips Taiwan,” and Philips da Amazonia Industria electronic Ltda., or “Philips Brazil.”<sup>227</sup>
106. **Samsung Entities:** Samsung Electronics Co., Ltd., or “SEC,” is a South Korean company that manufactured, sold and distributed of CRTs and CRT Products independently and through several subsidiaries including, Samsung Electronics America, Inc., or “SEAI,” Samsung SDI (Malaysia) Sdn Bhd., or “Samsung Malaysia,” Samsung SDI Co., Ltd., “Samsung SDI,” Samsung SDI America, Inc., or “Samsung America,” Samsung SDI Mexico S.A. de C.V., or “Samsung SDI Mexico,” Samsung SDI Brazil Ltd., or “Samsung SDI Brazil,” Shenzhen Samsung SDI Co., Ltd., or “Samsung SDI Shenzhen,” and Tianjin Samsung SDI Co., Ltd., or “Samsung SDI Tianjin.”<sup>228</sup>

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<http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=7827825>.

<sup>224</sup> Panasonic USA, “Consumer Search Results: “CRT TVs”,”  
<http://shop.panasonic.com/search/?siteView=DEFAULT&q=crt%20tvs>, accessed January 9, 2012.

<sup>225</sup> PHLP-CRT-051982-PHLP-CRT-052085 at 51998; A.A.M. Deterink, “Trustee’s First Report in the bankruptcy of LG.Philips Displays Holding B.V. and LG.Philips Displays Netherlands B.V.,” March 1, 2006, 6-8,  
[http://deterinklive.com/nl/download/?file=workspace/uploads/faillissementsverslagen/lg\\_verslag1en\\_01032006.pdf](http://deterinklive.com/nl/download/?file=workspace/uploads/faillissementsverslagen/lg_verslag1en_01032006.pdf).

<sup>226</sup> PHLP-CRT-051982-PHLP-CRT-052085 at 052004 and 052053.

<sup>227</sup> Koninklijke Philips Electronics N.V., “Form 20-F: Exhibit 8,” December 31, 2011, 1, 9, 13 and 15,  
<http://www.sec.gov/Archives/edgar/data/313216/000095012311015455/u10449exv8.htm>.

<sup>228</sup> Samsung Electronics Co., Ltd. and Subsidiaries, “Notes to the Consolidated Financial Statements,” 2012 Quarter 1, 14-18,  
[http://www.samsung.com/us/aboutsamsung/ir/financialinformation/auditedfinancialstatements/download/s/consolidated/2012\\_con\\_quarter01\\_note.pdf](http://www.samsung.com/us/aboutsamsung/ir/financialinformation/auditedfinancialstatements/download/s/consolidated/2012_con_quarter01_note.pdf). Samsung SDI, “Overseas Plants,”

107. **Thai CRT:** Thai CRT Company, Ltd., or “Thai CRT,” is a Thai CRT manufacturer, and, a subsidiary of Siam Cement Group.<sup>229</sup>
108. **Toshiba Entities:** Toshiba Corporation, or “TC,” is a Japanese CRT manufacturer and co-owner<sup>230</sup> of Matsushita Toshiba Picture Display Co., Ltd., as previously described.<sup>231</sup> Toshiba America, Inc., or “Toshiba America,” Toshiba America Consumer Products LLC, or “TACP,” Toshiba America Consumer Products, Inc., or “TACPI,” Toshiba America Electronic Components, Inc., or “TAEP,” and Toshiba America Information Systems, Inc., or “TAIP,” are all American subsidiaries that manufactured, sold and distributed CRT Products.<sup>232</sup> Toshiba Display Devices (Thailand) Company, Ltd., or “TDDT,” is a Thai subsidiary of TC that sold and distributed CRT Products.<sup>233</sup>
109. **Thomson:** Technicolor SA, known as Thomson SA until 2010,<sup>234</sup> is a French technology company that manufactures products and provides services in the media and entertainment industries.<sup>235</sup> Thomson sold TVs in the US under the RCA

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[http://www.samsungsdi.com/intro/c\\_7\\_2\\_1\\_5P.html](http://www.samsungsdi.com/intro/c_7_2_1_5P.html).

<sup>229</sup> The Siam Cement Group, “Thai CRT Co., Ltd. (TCRT) Restructures Ownership,” February 16, 2005, [http://www.scg.co.th/en/04investor\\_governance/03\\_investors\\_news/detail.php?ContentId=28](http://www.scg.co.th/en/04investor_governance/03_investors_news/detail.php?ContentId=28).

<sup>230</sup> Toshiba, “Closure of MT Picture Display (M) Sdn. Bhd.,” IR News, July 26, 2006, <http://www.toshiba.co.jp/about/ir/en/news/20060726.htm>.

<sup>231</sup> Toshiba America, “Inside Toshiba,” [http://www.toshiba.com/tai/about\\_us.jsp](http://www.toshiba.com/tai/about_us.jsp); Block, Ryan, “Toshiba killing CRTs and analog tuners,” Engadget, February 21, 2006, <http://www.engadget.com/2006/02/21/toshiba-killing-crts-and-analog-tuners/>; PHLP-CRT-051982-PHLP-CRT-052085 at 52068-52069.

<sup>232</sup> Toshiba America, “Inside Toshiba,” [http://www.toshiba.com/tai/about\\_us.jsp](http://www.toshiba.com/tai/about_us.jsp); Toshiba, “Toshiba in the Americas,” <http://www.toshiba.com/tai/americas/us.jsp>.

<sup>233</sup> Toshiba, “Toshiba Display Devices (Thailand) Celebrates 7<sup>th</sup> Anniversary with Start of Full-Scale Manufacturing of Color Display Tubes,” August 29, 1995, [http://www.toshiba.co.jp/about/press/1995\\_08/pr2901.htm](http://www.toshiba.co.jp/about/press/1995_08/pr2901.htm).

<sup>234</sup> “Thomson changes name to Technicolor, sells unit to Sony,” telecompaper, <http://www.telecompaper.com/news/thomson-changes-name-to-technicolor-sells-unit-to-sony--715404>.

<sup>235</sup> “Technicolor SA Full Description,” Reuters, <http://www.reuters.com/finance/stocks/companyProfile?symbol=TCLRY.PK>.



brand.<sup>236</sup> Thomson was a major manufacturer of CRTs for television sets until 2005 when it sold its CPT business.<sup>237</sup> Most of Thomson's manufacturing facilities were in low-cost countries such as China, Mexico, Poland and Thailand,<sup>238</sup> though it had manufacturing facilities in the US, as well.<sup>239</sup> A plant in Circleville, Ohio manufactured glass components for television picture tubes from 1987-2004.<sup>240</sup> Thomson Inc USA, was incorporated in 1987 and is based in Indiana.<sup>241</sup> A plant in Marion, Indiana assembled CRTs for Thomson from 1988 – 2004.<sup>242</sup>

110. In 2003, Thomson moved its television production to TCL-Thomson Electronics (TTE), a joint venture with TCL Multimedia Technology Holdings. In early 2005, Thomson sold its Italian CRT plant to Videocon Group and by June 2005, Thomson sold all its CRT activities in China, Mexico and Poland to Videocon.<sup>243</sup>
111. **Mitsubishi:** Mitsubishi Electric is a Japanese corporation with subsidiaries located throughout the world, including the US.<sup>244</sup> Mitsubishi Electric US Holdings, Inc. (also "Mitsubishi Electric America, Inc."), the principal subsidiary of Mitsubishi Electric

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<sup>236</sup> John Tagliabue, "Thomson and TCL To Join TV Units," *The New York Times*, Nov 4, 2003.

<sup>237</sup> Thomson never had activity in the CDT business. See Thomson, "United States Securities and Exchange Commission: Form 20-F," Washington, DC, May 6, 2009, 7.

<sup>238</sup> Thomson, "United States Securities and Exchange Commission: 2002 Form 20-F," Washington, DC, May 30, 2003, 43.

<sup>239</sup> "BEW Members at Thomson Inc. Face Shutdown of TV Tube and Glass Plants," IBEW Journal, May 2004, <http://www.ibew.org/articles/04journal/0405/p11.htm>.

<sup>240</sup> "RCA Corporation," Ohio EPA, <http://www.epa.ohio.gov/cdo/rca.aspx>.

<sup>241</sup> "Company Overview of Technicolor USA, Inc.," Bloomberg Businessweek, <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=1526194>.

<sup>242</sup> "BEW Members at Thomson Inc. Face Shutdown of TV Tube and Glass Plants," IBEW Journal, May 2004, <http://www.ibew.org/articles/04journal/0405/p11.htm>.

<sup>243</sup> Paul Semenza, "Thomson moving away from CRT TVs, but CRTs sticking around," *DigiTimes*, July 21, 2005.

<sup>244</sup> "About Us - Locations Worldwide," <http://www.mitsubishielectric.com/company/about/locations/index.html>.

Corporation, is headquartered in Cypress, CA.<sup>245</sup> During the class period, Mitsubishi manufactured CRTs in Mexico and Canada and produced television receivers in the US.<sup>246</sup> Starting in 1983 through 1998, Mitsubishi manufactured CPTs in a plant in Canada.<sup>247</sup> Also, from 1998 through 2003, Mitsubishi manufactured CDTs in Mexico through its subsidiary, Mitsubishi Electric America Inc.<sup>248</sup>

112. **Joint Ventures:** MT Picture Display Co., Ltd., formerly Matsushita Toshiba Picture Display Co., Ltd., or “MTPD,” is a Japanese CRT manufacturer co-owned by Panasonic Corporation and Toshiba.<sup>249</sup> However, MTPD became a full subsidiary of MEI in 2007.<sup>250</sup> Beijing-Matsushita Color CRT Company, Ltd., or “BMCC,” is a Chinese manufacturer of CRTs, founded as a joint venture between Panasonic and Beijing, People’s Republic of China.<sup>251</sup> LG. Philips Displays, or “LPD,” was a joint venture between LGEI and Koninklijke Philips Electronics N.V. as described above.

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<sup>245</sup> “Company Overview of Mitsubishi Electric US Holdings, Inc.,” Bloomberg Businessweek, <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=6450476>.

<sup>246</sup> John Kitzmiller, *Industry and Trade Summary Television Picture Tubes and Other Cathode-Ray Tubes*, (USITC Publication 2877, 1995): 4.

<sup>247</sup> Martin Kenney, “The Shifting Value Chain: The Television Industry in North America,” *Locating Global Advantage*, ed. Martin Kenney and Richard Florida (Stanford: Stanford University Press, 2003), 106. “Mitsubishi Electric Corporation – Company Profile, Information, Business Description, History, Background Information on Mitsubishi Electric Corporation,” Reference for Business, <http://www.referenceforbusiness.com/history2/47/Mitsubishi-Electric-Corporation.html>.

<sup>248</sup> “Mitsubishi Electric To Manufacture CRTs In Mexico Through a New U.S. Subsidiary,” The Free Library, <http://www.thefreelibrary.com/Mitsubishi+Electric+To+Manufacture+CRTs+In+Mexico+Through+a+N> ew+U.S....-a019756115; “Mitsubishi to close CRT plant,” Telecompaper, <http://www.telecompaper.com/news/mitsubishi-to-close-crt-plant--391794>.

<sup>249</sup> Toshiba, “Closure of MT Picture Display (M) Sdn. Bhd.,” IR News, July 26, 2006, <http://www.toshiba.co.jp/about/ir/en/news/20060726.htm>.

<sup>250</sup> Panasonic Corporation, “Panasonic Form 20-F,” March 31, 2011, [http://www.sec.gov/Archives/edgar/data/63271/000119312511178201/d20f.htm#rom123323\\_46](http://www.sec.gov/Archives/edgar/data/63271/000119312511178201/d20f.htm#rom123323_46), 24.

<sup>251</sup> Panasonic, “Panasonic History: 1987 Joint Venture Company Beijing established,” <http://panasonic.net/history/corporate/chronicle/1987-01.html>.

LG. Philips Displays became the independent company LP Displays International, Ltd. on April 1, 2007.<sup>252</sup>

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<sup>252</sup> Businessweek, “Company Overview of LP Displays,” <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=1492342>; Tarr, Greg, “CRT Maker LG. Philips Displays Changes Names,” *Twice*, March 16, 2007, <http://www.twice.com/news/crt-maker-lgphilips-displays-changes-name-0>.

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**APPENDIX B. Competitor Communications About Production**

| Quarter    | Bates Number     | Attending or Referenced Manufacturers <sup>1</sup> | Product Type | Production Topic |                |                      |
|------------|------------------|--|--------------|------------------|----------------|----------------------|
|            |                  |  |              | Line Shutdown    | Line Reduction | Information Exchange |
| (1)        | (2)              | (3)  | (4)          | (5)              | (6)            | (7)                  |
| 1. 1995Q3  | CHU00028873E     | SDI, CPT   | CPT          |                  |                | X                    |
| 2. 1996Q2  | CHU00028815E     | SDI, CPT   | CDT          |                  |                | X                    |
| 3. 1996Q3  | CHU00028803E     | SDI, CPT   | CPT          |                  |                | X                    |
| 4. 1996Q4  | CHU00028396E     | CPT, SDI   | CDT          |                  |                | X                    |
| 5. 1996Q4  | CHU00028786E     | SDI, CPT, ORION                                    | CDT          |                  |                | X                    |
| 6. 1996Q4  | CHU00028909E     | CPT, LG  | CDT          |                  |                | X                    |
| 7. 1997Q1  | CHU00028758E     | SDI, CPT, HITACHI, LG, ORION, PHILIPS (PH)         | CDT          |                  | X              |                      |
| 8. 1997Q1  | CHU00028760E     | SDI, LG, PHILIPS (PH), CPT                         | CDT          |                  |                | X                    |
| 9. 1997Q1  | CHU00028763E     | CPT, SDI   | CDT          |                  | X              |                      |
| 10. 1997Q1 | CHU00028768E     | SDI, CPT, PHILIPS (PH), ORION                      | CDT          |                  | X              |                      |
| 11. 1997Q2 | CHU00028283E     | TOSHIBA, CPT                                       | CDT          |                  |                | X                    |
| 12. 1997Q2 | CHU00028725E     | CPT, SDI, PHILIPS (PH), LG                         | CDT          |                  |                | X                    |
| 13. 1997Q3 | CHU00028707E     | SDI, CPT   | CDT          |                  |                | X                    |
| 14. 1997Q4 | CHU00020779E     | LG, TOSHIBA, THAI-CRT, CPT                         | CPT          |                  |                | X                    |
| 15. 1997Q4 | CHU00028670E     | SDI, CPT   | CDT          |                  |                | X                    |
| 16. 1997Q4 | CHU00028674E     | SDI, CPT   | CDT          |                  | X              |                      |
| 17. 1997Q4 | CHU00028677E     | CPT, SDI   | CDT          |                  |                | X                    |
| 18. 1997Q4 | CHU00028691E     | SDI, PHILIPS (PH), CPT                             | CDT          |                  |                | X                    |
| 19. 1998Q1 | CHU00028666E     | SDI, CPT   | CDT          | X                |                | X                    |
| 20. 1998Q1 | CHU00028955E     | CPT, ORION   | CDT          |                  |                | X                    |
| 21. 1998Q2 | CHU00028642E     | CPT, SDI   | CDT          |                  | X              | X                    |
| 22. 1998Q2 | CHU00028952E     | CPT, ORION   | CDT          |                  |                | X                    |
| 23. 1998Q2 | CHU00028638E     | CPT, SDI   | BOTH         |                  | X              |                      |
| 24. 1998Q3 | CHU00029262E     | CPT, SDI, LG, ORION, THAI-CRT, TOSHIBA             | CPT          |                  | X              |                      |
| 25. 1998Q3 | CHU00030670E     | CPT, SDI, LG, ORION, THAI-CRT                      | CPT          |                  | X              | X                    |
| 26. 1998Q4 | CHU00029259E     | CPT, SDI, LG, ORION, THAI-CRT                      | CPT          |                  | X              | X                    |
| 27. 1998Q4 | CHU00030679E     | CPT, PHILIPS, SDI, ORION, IRICO, LG                | CDT          |                  |                | X                    |
| 28. 1998Q4 | CHU00030684E     | CPT, PHILIPS (PH), SDI, ORION, BMCC, IRICO         | CDT          |                  |                | X                    |
| 29. 1998Q4 | SDCRT-0086434E   | SDI, CPT, LG, PHILIPS (PH), ORION                  | CDT          |                  | X              |                      |
| 30. 1998Q4 | SDCRT-0086449E   | CPT, PHILIPS (PH), ORION, LG, SDI                  | CDT          |                  | X              | X                    |
| 31. 1998Q4 | CHU00028532-33E  | CPT, MITSUBISHI                                    | BOTH         |                  |                | X                    |
| 32. 1999Q1 | CHU00030705E     | CPT, PHILIPS, SDI, LG, ORION, IRICO, BMCC          | CDT          |                  |                | X                    |
| 33. 1999Q1 | CHU00030731E     | CPT, SDI, LG, ORION, PHILIPS (PH)                  | CDT          |                  | X              |                      |
| 34. 1999Q1 | SDCRT-0086563E   | LG, CPT, ORION, SDI, PHILIPS (PH)                  | CDT          |                  | X              | X                    |
| 35. 1999Q1 | SDCRT-0086569-70 | LG, SDI, ORION, CPT, PHILIPS (PH)                  | CDT          |                  | X              |                      |
| 36. 1999Q2 | CHU00029214      | CPT, SDI, LG, ORION                                | CPT          |                  | X              |                      |
| 37. 1999Q2 | CHU00030769E     | CPT, IRICO   | CPT          |                  |                | X                    |
| 38. 1999Q2 | TSB-CRT-00045123 | TOSHIBA, CPT                                       | CPT          |                  | X              |                      |
| 39. 1999Q2 | CHU00030745E     | CPT, PHILIPS (PH), SDI, ORION, IRICO, BMCC         | CDT          |                  |                | X                    |
| 40. 1999Q2 | CHU00030752E     | CPT, PHILIPS, SDI, ORION, IRICO                    | CDT          |                  | X              | X                    |
| 41. 1999Q2 | CHU00030787E     | CPT, SDI, PHILIPS (PH), ORION, LG                  | CDT          |                  | X              |                      |
| 42. 1999Q2 | SDCRT-0086593E   | CPT, PHILIPS (PH), ORION, LG, SDI                  | CDT          |                  | X              |                      |
| 43. 1999Q2 | SDCRT-0086597E   | PHILIPS (PH), CPT, SDI, ORION, LG                  | CDT          |                  |                | X                    |
| 44. 1999Q2 | SDCRT-0086605E   | CPT, PHILIPS (PH), ORION, LG, SDI                  | CDT          |                  | X              |                      |
| 45. 1999Q2 | SDCRT-0086632E   | CPT, PHILIPS (PH), ORION, LG, SDI                  | CDT          |                  | X              | X                    |
| 46. 1999Q2 | SDCRT-0086641E   | CPT, PHILIPS (PH), ORION, LG, SDI                  | CDT          |                  | X              | X                    |
| 47. 1999Q2 | SDCRT-0086584E   | SDI, CPT, PHILIPS (PH)                             |              |                  | X              | X                    |
| 48. 1999Q3 | CHU00029245E     | CPT, SDI, LG, ORION, THAI-CRT                      | CPT          |                  |                | X                    |
| 49. 1999Q3 | CHU00028441E     | CPT, MEC   | CDT          |                  |                | X                    |
| 50. 1999Q3 | CHU00030809E     | CPT, SDI, LG, ORION, PHILIPS (PH)                  | CDT          |                  | X              |                      |

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| Quarter     | Bates Number       | Attending or Referenced Manufacturers <sup>1</sup>        | Product Type | Production Topic |                |                      |
|-------------|--------------------|---|--------------|------------------|----------------|----------------------|
|             |                    |   |              | Line Shutdown    | Line Reduction | Information Exchange |
| (1)         | (2)                | (3)   | (4)          | (5)              | (6)            | (7)                  |
| 51. 1999Q3  | CHU00030823E       | CPT, SDI, BMCC, ORION, IRICO, PHILIPS (PH)                | CDT          |                  |                | X                    |
| 52. 1999Q3  | CHU00030835E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              |                      |
| 53. 1999Q3  | CHU00030843E       | CPT, SDI, IRICO, ORION, PHILIPS                           | CDT          |                  |                | X                    |
| 54. 1999Q3  | CHU00030851E       | CPT, TOSHIBA  | CDT          |                  |                | X                    |
| 55. 1999Q3  | CHU00030855E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              | X                    |
| 56. 1999Q3  | SDCRT-0086649E     | CPT, LG, PHILIPS (PH), SDI, ORION                         | CDT          |                  | X              |                      |
| 57. 1999Q3  | SDCRT-0086672E     | PHILIPS (PH), IRICO, SDI, ORION, CPT, BMCC                | CDT          |                  |                | X                    |
| 58. 1999Q3  | SDCRT-0086691      | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              |                      |
| 59. 1999Q3  | SDCRT-0086698E     | PHILIPS (PH), ORION, IRICO, CPT, SDI                      | CDT          |                  |                | X                    |
| 60. 1999Q3  | CHU00029175E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | BOTH         |                  |                | X                    |
| 61. 1999Q3  | CHU00029179E       | CPT, SDI, LG, ORION, THAI-CRT                             | BOTH         |                  |                | X                    |
| 62. 1999Q4  | CHU00029171E       | CPT, SDI, LG, ORION, THAI-CRT                             | CPT          |                  | X              | X                    |
| 63. 1999Q4  | CHU00030888E       | CPT, SDI, PHILIPS (PH), ORION, LG                         | CDT          |                  |                | X                    |
| 64. 1999Q4  | SDCRT-0086703E     | CPT, PHILIPS (PH), SDI                                    | CDT          |                  | X              |                      |
| 65. 2000Q1  | CHU00029138E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CPT          |                  |                | X                    |
| 66. 2000Q1  | CHU00029144E       | CPT, SDI, LG, ORION, PHILIPS (PH), THAI-CRT               | CPT          |                  |                | X                    |
| 67. 2000Q1  | CHU00029147E       | CPT, SDI, LG, ORION, PHILIPS (PH), THAI-CRT               | CPT          |                  |                | X                    |
| 68. 2000Q1  | CHU00030720E       | CPT, SDI, PHILIPS (PH), LG, ORION                         | CDT          |                  | X              |                      |
| 69. 2000Q1  | CHU00030960E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              | X                    |
| 70. 2000Q1  | CHU00030965E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              |                      |
| 71. 2000Q1  | CHU00030973E       | CPT, SDI, IRICO, PHILIPS (PH)                             | CDT          |                  |                | X                    |
| 72. 2000Q1  | CHU00030985E       | CPT, SDI  | CDT          | X                |                |                      |
| 73. 2000Q2  | CHU00029110E       | CPT, PHILIPS (PH), IRICO                                  | CPT          |                  |                | X                    |
| 74. 2000Q2  | CHU00029131E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CPT          |                  | X              |                      |
| 75. 2000Q2  | CHU00031002E       | CPT, SDI, IRICO, BMCC, LG, PHILIPS (PH), ORION            | CDT          |                  | X              | X                    |
| 76. 2000Q2  | CHU00031006E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              |                      |
| 77. 2000Q2  | CHU00031010E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              |                      |
| 78. 2000Q3  | CHU00029108E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CPT          |                  |                | X                    |
| 79. 2000Q3  | CHU00031056E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CPT          |                  |                | X                    |
| 80. 2000Q3  | CHU00031040E       | CPT, SDI, IRICO, BMCC, LG, PHILIPS (PH), ORION            | CDT          |                  | X              | X                    |
| 81. 2000Q3  | CHU00031044E       | CPT, SDI, IRICO, BMCC, LG, PHILIPS (PH), ORION            | CDT          |                  | X              | X                    |
| 82. 2000Q3  | CHU00031047E       | CPT, TOSHIBA  | CDT          |                  |                | X                    |
| 83. 2000Q4  | CHU00031075E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              | X                    |
| 84. 2000Q4  | SDCRT-0087393E-98E | LG, CPT, PHILIPS (PH), ORION, SDI, TOSHIBA                | CDT          |                  | X              | X                    |
| 85. 2001Q1  | SDCRT-0087662E     | PHILIPS (PH), THOMSON, SDI, ORION                         | CPT          |                  |                | X                    |
| 86. 2001Q1  | CHU00031111E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          |                  | X              | X                    |
| 87. 2001Q1  | SDCRT-0087405-E07E | CPT, LG, PHILIPS (PH), ORION, SDI                         | CDT          |                  | X              |                      |
| 88. 2001Q2  | CHU00036414E       | CPT, SDI, LG, ORION                                       | CPT          |                  |                | X                    |
| 89. 2001Q2  | SDCRT-0087340E-42E | BMCC, CPT, LG, IRICO, PHILIPS (PH), THOMSON, SDI, HITACHI | CPT          | X                | X              | X                    |
| 90. 2001Q2  | SDCRT-0087667E     | PHILIPS (PH), THOMSON, SDI, ORION                         | CPT          |                  |                | X                    |
| 91. 2001Q2  | CHU00024554E       | SDI, LG, ORION, PHILIPS (PH), CPT                         | CDT          |                  | X              |                      |
| 92. 2001Q2  | CHU00031142E       | CPT, SDI, LG, ORION, PHILIPS (PH)                         | CDT          | X                | X              | X                    |
| 93. 2001Q2  | CHU00660306-11E    | SDI, LG, ORION, CPT                                       | CDT          | X                | X              | X                    |
| 94. 2001Q2  | CHU00660395        | PHILIPS (PH), CPT, LG, ORION, SDI                         | CDT          |                  | X              |                      |
| 95. 2001Q3  | CHU00036384E       | CPT, SDI, LG, ORION                                       | CPT          |                  |                | X                    |
| 96. 2001Q3  | CHU00036386E       | CPT, SDI, LG, ORION, THAI-CRT                             | CPT          |                  | X              | X                    |
| 97. 2001Q3  | SDCRT-0087664      | PHILIPS (PH), THOMSON, SDI, ORION                         | CPT          |                  | X              |                      |
| 98. 2001Q3  | CHU00031150E       | CPT, SDI, LG, ORION                                       | CDT          |                  | X              | X                    |
| 99. 2001Q3  | CHU00660408-418    | SDI, LG, ORION, CPT, PHILIPS (PH)                         | CDT          | X                | X              |                      |
| 100. 2001Q3 | CHU00660454        | SDI, LG, PHILIPS (PH), ORION, CPT                         | CDT          | X                | X              |                      |
| 101. 2001Q4 | CHU00036390E       | CPT, SDI, LG, ORION                                       | CPT          |                  | X              |                      |
| 102. 2001Q4 | CHU00036408E       | CPT, SDI, LPD, ORION                                      | CPT          |                  |                | X                    |
| 103. 2001Q4 | CHU00028589E       | CPT, SDI, LPD   |              |                  | X              |                      |
| 104. 2002   | CHU00660369        | LPD, SDI, ORION, CPT                                      | CDT          |                  |                | X                    |
| 105. 2002Q1 | CHU00036392E       | CPT, SDI, LPD, ORION                                      | CPT          |                  |                | X                    |
| 106. 2002Q1 | CHU00036394E       | CPT, SDI, LPD, ORION                                      | CPT          |                  |                | X                    |
| 107. 2002Q1 | CHU00660419-425    | SDI, LPD, ORION, CPT                                      | CDT          | X                |                |                      |
| 108. 2002Q2 | CHU00660373-382    | CPT, LPD, ORION, SDI                                      | CPT          |                  | X              |                      |
| 109. 2002Q3 | CHU00660468-475    | CPT, LPD, ORION, SDI                                      | CDT          |                  |                | X                    |
| 110. 2002Q3 | CHU00660487-500    | CPT, LPD, SDI, ORION                                      | CDT          | X                |                | X                    |

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| Quarter     | Bates Number          | Attending or Referenced Manufacturers <sup>1</sup> | Product Type | Production Topic |                |                      |
|-------------|-----------------------|--|--------------|------------------|----------------|----------------------|
|             |                       |  |              | Line Shutdown    | Line Reduction | Information Exchange |
| (1)         | (2)                   | (3)  | (4)          | (5)              | (6)            | (7)                  |
| 111. 2002Q3 | CHU00660194E          | SDI, LPD, ORION                                    | BOTH         |                  |                | X                    |
| 112. 2002Q4 | CHU00125162E          | SDI, LPD, CPT                                      | CPT          |                  |                | X                    |
| 113. 2002Q4 | SDCRT-0006632E-33E    | SDI, THOMSON, ORION                                | CPT          |                  |                | X                    |
| 114. 2002Q4 | CHU00660476-486       | CPT, LPD, SDI, ORION, TOSHIBA                      | CDT          |                  |                | X                    |
| 115. 2002Q4 | SDCRT-0087427-29      | CPT, ORION, SDI, LPD                               | CDT          |                  |                | X                    |
| 116. 2003Q1 | CHU00020661E          | CPT, THAI-CRT, MEC, TOSHIBA                        | CDT          |                  |                | X                    |
| 117. 2003Q1 | CHU00031804E          | CPT, SDI   | CDT          | X                |                |                      |
| 118. 2003Q1 | SDCRT-0006041E        | SDI, MITSUBISHI                                    | CDT          |                  |                | X                    |
| 119. 2003Q2 | CHU00030547E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 120. 2003Q2 | MTPD-0423675E         | SDI, MTPD, LPD                                     | CPT          |                  |                | X                    |
| 121. 2003Q2 | SDCRT-0088635_CT_715E | LPD, SDI, CPT, THAI-CRT, TOSHIBA                   | CPT          |                  |                | X                    |
| 122. 2003Q2 | CHU00660213E          | LPD, SDI, CPT                                      | CDT          | X                |                | X                    |
| 123. 2003Q2 | CHU00660539-548       | CPT, LPD, SDI                                      | CDT          | X                | X              |                      |
| 124. 2003Q2 | CHU00660549-560       | CPT, LPD, SDI                                      | CDT          | X                | X              | X                    |
| 125. 2003Q2 | CHU00660561-574       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 126. 2003Q3 | MTPD-0576483E         | TOSHIBA, MTPD, THOMSON                             | CPT          |                  |                | X                    |
| 127. 2003Q3 | CHU00031190E          | CPT, LPD, SDI                                      | CDT          | X                |                | X                    |
| 128. 2003Q3 | CHU00031194E          | CPT, LPD, SDI                                      | CDT          | X                |                | X                    |
| 129. 2003Q3 | CHU00660575-585       | CPT, LPD, SDI                                      | CDT          | X                | X              |                      |
| 130. 2003Q3 | CHU00660586-593       | CPT, LPD, SDI                                      | CDT          | X                | X              |                      |
| 131. 2003Q3 | CHU00660594-605       | CPT, LPD, SDI                                      | CDT          | X                | X              |                      |
| 132. 2003Q3 | CHU00660606-615       | CPT, LPD, SDI                                      | CDT          | X                | X              |                      |
| 133. 2003Q4 | CHU00030067E          | CPT, IRICO   | CPT          |                  |                | X                    |
| 134. 2003Q4 | CHU00030071E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 135. 2003Q4 | SDCRT-0088635         | LPD, SDI, THOMSON                                  | CPT          |                  | X              |                      |
| 136. 2003Q4 | SDCRT-0088635_CT_839  | SDI, LPD, CPT                                      | CPT          |                  |                | X                    |
| 137. 2003Q4 | CHU00031214E          | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 138. 2003Q4 | CHU00031221E          | CPT, LPD, SDI                                      | CDT          | X                |                | X                    |
| 139. 2003Q4 | CHU00660633-643       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 140. 2003Q4 | CHU00660644-655       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 141. 2003Q4 | CHU00660656-662       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 142. 2004Q1 | CHU00030036E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 143. 2004Q1 | MTPD-0423651E         | CPT, SDI, MTPD, THAI-CRT, LPD                      | CPT          |                  |                | X                    |
| 144. 2004Q1 | CHU00031227E          | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 145. 2004Q1 | CHU00660663-670       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 146. 2004Q1 | SDCRT-0088846         | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 147. 2004Q2 | CHU00030005E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 148. 2004Q2 | CHU00030530E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 149. 2004Q2 | MTPD-0426088E         | SDI, LPD, CPT, THAI-CRT, MTPD                      | CPT          |                  |                | X                    |
| 150. 2004Q2 | CHU00030020E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | BOTH         |                  |                | X                    |
| 151. 2004Q3 | CHU00030506E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 152. 2004Q3 | MTPD-0607598          | MTPD, LPD, SDI                                     | CPT          |                  |                | X                    |
| 153. 2004Q3 | CHU00660717-727       | CPT, LPD, SDI                                      | CDT          | X                | X              |                      |
| 154. 2004Q3 | CHU00660728-735       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 155. 2004Q3 | SDCRT-0090328         | CPT, LPD, SDI                                      | CDT          |                  | X              |                      |
| 156. 2004Q3 | SDCRT-0090339-44      | SDI, LPD, CPT                                      | CDT          | X                |                |                      |
| 157. 2004Q4 | CHU00029999E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 158. 2004Q4 | MTPD-0580798          | MTPD, LPD, SDI                                     | CPT          |                  |                | X                    |
| 159. 2004Q4 | SDCRT-0090197E        | LPD, CPT, MTPD, THAI-CRT, SDI                      | CPT          |                  |                | X                    |
| 160. 2004Q4 | CHU00071480E          | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 161. 2004Q4 | CHU00660736-740       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 162. 2004Q4 | SDCRT-0090233         | CPT, LPD, SDI                                      | CDT          | X                |                |                      |

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| Quarter     | Bates Number          | Attending or Referenced Manufacturers <sup>1</sup> | Product Type | Production Topic |                |                      |
|-------------|-----------------------|--|--------------|------------------|----------------|----------------------|
|             |                       |  |              | Line Shutdown    | Line Reduction | Information Exchange |
| (1)         | (2)                   | (3)  | (4)          | (5)              | (6)            | (7)                  |
| 163. 2004Q4 | SDCRT-0090233_CT_355E | SDI, LPD, CPT                                      | CDT          |                  |                | X                    |
| 164. 2005Q1 | SDCRT-0091353E        | LPD, MTPD, SDI                                     | CPT          |                  |                | X                    |
| 165. 2005Q1 | SDCRT-0091491-504     | THOMSON, LPD, SDI                                  | CPT          |                  | X              |                      |
| 166. 2005Q1 | CHU00647932-943       | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 167. 2005Q1 | SDCRT-0091027_616E    | CPT, LPD, SDI                                      | CDT          | X                | X              |                      |
| 168. 2005Q1 | SDCRT-0091599E        | CPT, LPD, SDI                                      | CDT          | X                |                | X                    |
| 169. 2005Q1 | SDCRT-0091605-15      | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 170. 2005Q2 | CHU00029971E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 171. 2005Q2 | CHU00030497E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 172. 2005Q2 | MTPD-0400573          | MTPD, LPD, SDI                                     | CPT          |                  |                | X                    |
| 173. 2005Q2 | SDCRT-0091364E        | LPD, MTPD, CPT, THAI-CRT, SDI                      | CPT          |                  |                | X                    |
| 174. 2005Q2 | SDCRT-0091372E        | LPD, MTPD, CPT, THAI-CRT, SDI                      | CPT          |                  |                | X                    |
| 175. 2005Q2 | SDCRT-0091374E        | LPD, MTPD, CPT, THAI-CRT, SDI                      | CPT          |                  |                | X                    |
| 176. 2005Q2 | CHU00014204E          | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 177. 2005Q2 | SDCRT-0091634         | CPT, LPD, SDI                                      | CDT          | X                |                |                      |
| 178. 2005Q2 | SDCRT-0091643E-47E    | CPT, LPD, SDI                                      | CDT          | X                |                | X                    |
| 179. 2005Q2 | SDCRT-0091661-67      | CPT, LPD, SDI                                      | CDT          | X                |                | X                    |
| 180. 2005Q3 | MTPD-0423645          | MTPD, LPD, SDI                                     | CPT          |                  |                | X                    |
| 181. 2005Q3 | SDCRT-0091524E        | IRICO, SDI   | BOTH         |                  | X              | X                    |
| 182. 2005Q4 | CHU00030468E          | CPT, MTPD, SDI, LPD, THAI-CRT                      | CPT          |                  |                | X                    |
| 183. 2005Q4 | SDCRT-0091400E        | LPD, MTPD, CPT, THAI-CRT, SDI                      | CPT          |                  |                | X                    |
| 184. 2005Q4 | CHU00014218E          | LPD, CPT, SDI, ORION                               | CDT          |                  |                | X                    |
| 185. 2006Q1 | MTPD-0580821          | MTPD, LPD, SDI                                     | CPT          |                  |                | X                    |
| 186. 2006Q4 | CHU00102752E          | CPT, BMCC, IRICO, LPD, SDI, THOMSON, HITACHI       | CPT          |                  |                | X                    |

<sup>1</sup>Attending manufacturer when available. If not listed, referenced manufacturers were used.

Source: Conspiracy Documents.

Exhibit 1



**Phillip Johnson, Ph.D.**

**Curriculum Vitae**

Managing Director  
854 Diablo Road  
Danville, California 94526  
Email: [pjohnson@econone.com](mailto:pjohnson@econone.com)  
Tel: 925 403 1003

**EDUCATION**

PhD, University of California, Los Angeles, Economics, 1997  
MA, University of California, Los Angeles, Economics, 1993  
BA, California State University Northridge, Economics, 1991

**PROFESSIONAL EXPERIENCE**

*Econ One Research, Inc.,*

Managing Director, 2012 – Present

Senior Economist, 2009 – 2012

Economist, 2000 – 2009

*Instituto Tecnológico Autónomo de México (ITAM),*

Assistant Professor, 1997-2000

**AREAS OF ECONOMIC EXPERTISE**

Analysis of markets and antitrust issues  
Damages calculation and estimation  
Econometric and statistical analysis  
Impact issues in class actions  
Intellectual property damages and reasonable royalties

**AWARDS**

Jerry S. Cohen Memorial Fund Writing Award, for “Statistical Significance and Statistical Error in Antitrust Analysis,” <https://www.antitrustinstitute.org/awards>, June 21, 2018

**PUBLICATIONS AND RESEARCH**

“Testing for Bid Rigging in California Highway Construction Procurement,” 2020, with Nedko Yordanov and Alexander Berry

“Roundtable with Economists,” Antitrust, Spring 2018, with Dennis Carlton, Gregory Leonard, Maria Maher, and Carl Shapiro



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“Statistical Significance and Statistical Error in Antitrust Analysis,” *Antitrust Law Journal*, Vol. 81, 2017, with Edward Leamer and Jeffrey Leitzinger

“Increasing Focus on Information Exchanges Among Competitors,” *Law360*, April 2017, with Niyati Ahuja

“Regression Techniques for Estimating Overcharges Using Market Concentration Data,” *American Bar Association, Section of Antitrust Law, Economics Committee Newsletter*, Volume 12, Number 1, Summer 2012, with Armen Markosyan

“Reasonable Royalty Damages and License Structure,” *Econ One Newsletter*, Spring 2007

“A Surprising Result from Patent Infringement: Price Accretion Instead of Price Erosion,” *Econ One Newsletter*, Spring 2005

“Lost Profits Damages When Infringement Raises the Patentee’s Prices,” *American Bar Association, Section of Intellectual Property Law, Newsletter*, Volume 23, Number 1, Fall 2004, with Tessie Su

“Patent Damages and Price Erosion,” *Econ One Newsletter*, Fall 2003

“Evolution and Information in a Gift-Giving Game,” *Journal of Economic Theory*, Volume 100, 2001, with David Levine and Wolfgang Pesendorfer

“Mergers, Alliance and Welfare in Differentiated Markets with Quality-Improving Innovations in Markets with Complementary Goods,” with Tessie Su and Tridib Sharma

“Evolution and Information in a Prisoners’ Dilemma,” with David Levine and Wolfgang Pesendorfer

“The Stability of Monetary Institutions as a Social Institution”

## **PRESENTATIONS**

Economic Perspectives on Damages: What You Must Know, The Knowledge Group, October 2019

Antitrust Class Certification: Recent Trends and Developments, The Knowledge Group, August 2019

Statistical Issues with Regression Analysis for Antitrust Litigation, Kaplan Fox, 2015

West LegalEdCenter Patent Disputes Conference, 2013

Deposing the Expert Witness, NITA, 2012

Cross Examining Expert Witnesses, Annual Meeting of the California State Bar, 2012

West LegalEdCenter Patent Disputes Conference, 2011

Deposing the Expert Witness, NITA, 2011

Cross Examining Expert Witnesses, Trial Advocacy Group, 2011

Patent Damages Webinar, Law.com, 2010

Cross Examining Expert Witnesses, Trial Advocacy Group, 2009

Deposing the Expert Witness, NITA, 2008

Latin American Meetings of the Econometric Society, 1999

Stony Brook Summer Festival on Game Theory, 1999

University of California at Los Angeles, 1999

Allied Social Sciences Association, 1998

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Academica Sinica, Taiwan, 1997

National Taiwan University, 1997

Instituto Tecnológico Autónomo de México, 1997

Stony Brook Summer Festival on Game Theory, 1996

## **SUMMARY OF ENGAGEMENTS**

Alchem v. Terianne Cage and North American Nicotine. Retained to analyze damages arising from an alleged theft of trade secrets. Expert report. 2021 – Present.

Hunter et al v. Booz Allen Hamilton, Mission Essential, and CACI. Retained to analyze classwide impact and damages arising from alleged collusive no-poach agreement between Defendants. Expert reports and testimony, both in deposition and in a hearing on class certification. 2020 – Present.

In Re Keurig Green Mountain Single Serve Coffee Antitrust. Retained to analyze impact and damages to The McLane Company arising from alleged anticompetitive conduct by Keurig. Expert reports and deposition testimony. 2020 – Present.

In Re Keurig Green Mountain Single Serve Coffee Antitrust. Retained to analyze impact and damages to indirect purchasers arising from alleged anticompetitive conduct by Keurig. Settled. 2020.

In Re Rail Suppliers Antitrust. Retained to analyze data and issues relating to common impact and damages from an alleged no-poach agreement between manufacturers of rail equipment. Settled 2020.

Zephyr v. Compass et al. Retained to analyze damages arising from an alleged breach of no-poach provisions of a non-disclosure agreement during due diligence. Settled 2020.

HCF Insurance Agency v. Kevin Hamm et al. Retained to address antitrust issues involving an alleged group boycott relating to the provision of workers' compensation coverage for extended care facilities. Expert witness deposition testimony. Settled 2019.

Softwood Lumber. Retained to analyze claims that policies of Canada and its province, British Columbia resulted in below market stumpage fees that impacted trade in softwood lumber with the United States. 2015 – Present.

Chen-Oster vs. Goldman Sachs. Retained to analyze class certification issues and damages related to alleged gender discrimination. 2013 – Present.

In Re Duke/UNC Antitrust. Retained to analyze data and issues relating to common impact and damages from a no-hire agreement by Duke and University of North Carolina medical school faculty. Settled. 2016 - 2019.

L.A. Taxi Cooperative, et al. vs. Uber. Retained to address issues in an opposing expert economist's report regarding the analysis of Uber and taxi safety data. Expert report. Settled 2017.

In Re Lithium-Ion Batteries Antitrust. Retained to analyze data and issues relating to common impact and damages for a proposed class of indirect purchasers of products containing cylindrical lithium-ion batteries. Settled. 2015 - 2019.

Scott et al. vs. Chipotle Mexican Grill, Inc. Retained to analyze employee data and calculate damages related to the alleged misclassification of Chipotle Apprentices as salaried employees. Expert report and deposition testimony. 2015 – 2017.

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Margie Daniel, et al. v Ford Motor Company. Conducted an analysis of Defendant's experts' statistical procedures and provided analyses regarding a class of Ford Focus owners alleging a product defect. 2013 – 2018.

First Western Capital Management v. Kenneth D. Malamed. Retained to analyze damages relating to alleged misappropriation of trade secrets. Submitted an expert report. Settled. 2016 - 2017.

Surf City Steel, Inc. et al. vs. International Longshore and Warehouse Union, et al. Retained to analyze the competitive effects of an agreement to exclude contractors employing Ironworkers Union members from port crane modification and structural maintenance projects. Expert report and deposition testimony. Case dismissed. 2014 - 2017.

Kunkel et al v. John Wiley & Sons, Inc. Retained to analyze common impact and damages for a proposed class of photograph copyright holders who allege that Wiley infringed their copyrights in books it published. Expert report and deposition testimony. Settled. 2015 - 2017.

In Re: CRT Antitrust Litigation. Analyzed economic issues relating to class certification, liability, and damages in a price-fixing case for a class of direct purchasers of cathode ray tubes against the major manufacturers. Class certified. Settled. 2011 – 2017.

In Re: TFT-LCD Antitrust Litigation. Retained to analyze economic issues relating to antitrust liability and damages for Proview Technology Inc.'s (PTI) claims against manufacturers of TFT-LCD panels. Expert report. Settled. 2014 – 2015.

Cobb et al. vs. BSH Home Appliances. Retained to analyze manufacturers' service data relating to the incidence of mold in front-loading washers. Expert report and deposition testimony. Settled. 2014 – 2015.

Hemy vs. Perdue Farms. Retained to analyze class certification issues and damages relating to alleged product mislabeling of chicken meat products. Settled. 2014.

Apodaca vs. Whirlpool Corporation. Retained to analyze data relating to alleged defects in Maytag dishwashers. Case settled. 2014.

Symantec vs. Veeam. Retained to analyze lost profits, reasonable royalty, and irreparable harm resulting from alleged infringement of Symantec patents. Expert report. Case dismissed. 2013 – 2015.

Ottenberg, et al v. XY, LLC and Inguran, LLC. Retained to analyze antitrust issues and damages arising from the misuse of patents and intellectual for bovine sexing technology and related equipment and sorted semen straw markets. Expert report and deposition testimony. Settled 2013.

In Re: High Tech Workers Antitrust Litigation. Analyzed economic issues relating to class certification and damages for a class of employees of seven major technology companies (Apple, Adobe, Google, Intel, Intuit, Lucasfilm, and Pixar) alleging a series of agreements to limit competition for workers. Settled following class certification. 2012 – 2015.

In Re: TFT-LCD Antitrust Litigation. Analyzed economic issues relating to class certification, liability and damages for a class of direct purchasers of TFT-LCD panels against the major manufacturers of TFT-LCD panels. Class was certified and all defendants except Toshiba settled prior to trial. Toshiba was found liable, and damages were awarded to Plaintiffs. Toshiba settled following trial. 2008 – 2012.

Pecover v. Electronic Arts. Analyzed damages arising from the monopolization of football video games for a nationwide class of consumers. 2011 – 2012.

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Realtime Data v. Packeteer, et al. Retained by defendant Expand Networks as economic expert to provide analysis of markets for wide-area network acceleration products and calculate damages from alleged patent infringement. Expert reports and deposition testimony. 2008 – 2010.

In Re: Korean Airlines Co., LTD. Antitrust Litigation. Analyzed economic issues, including market definition and common impact, relating to the certification of a class of direct purchasers of travel between the U.S. and Korea against the major Korean Airlines. 2008 – 2010.

California State Foster Parent Assoc., et al. v. John A. Wagner, Director of the California Department of Social Services, in his official capacity, et al. Retained to analyze the economic and State budget impact of a change in foster care reimbursement policies. Expert report. 2008 - 2009.

High Point Sarl v. Sprint Nextel Corp., et al. Analyzed cellular communications markets and reasonable royalty rate in a patent case involving digital cellular communications technology. 2008 – 2009.

Montana Food Distributors Assoc. v. International Outsourcing Services et al. Conducted preliminary damages analysis in a case involving allegations of anticompetitive behavior and fraud by coupon processors. 2008 – 2009.

DealerTrack v. RouteOne, et al. Analyzed lost profits and reasonable royalty damages, and the commercial success of patented features in a case involving credit application aggregation systems used for automotive sales. 2007 – 2009.

Silvaco v. Cypress Semiconductor. Analyzed lost profits and unjust enrichment in a theft of trade secrets case involving providers and customers for software for the design of chips used in devices. Expert declarations. 2007 – 2009.

Amado v. Microsoft. Analyzed post-trial royalty rate in a patent case involving office productivity software technology. 2008.

Amex v. MasterCard, Visa, et al. Analyzed damages issues in a monopolization case involving the major providers of credit and charge cards. 2007 – 2008.

M.I., LLC v. Halliburton Energy Services, Inc. Analyzed relevant market and damages issues in an attempted monopolization case involving the alleged misuse of a patent on deepwater oil drilling fluid technology. 2007 – 2008.

In re: Kdur Antitrust Litigation. Analyzed relevant market and impact issues in a monopolization case involving branded and generic drugs. 2006 – 2007.

In re: Tricor Direct Purchaser Antitrust Litigation. Analyzed relevant market and impact issues in a monopolization case involving branded and generic drugs. 2006 – 2007.

In re: Nifedipine Antitrust Litigation. Analyzed relevant market and impact issues in a monopolization case involving branded and generic drugs. 2006 – 2007.

Columbus Drywall, et al. v. Masco Corporation. Analyzed antitrust issues and assisted in drafting liability report in a price fixing conspiracy case alleged to involve a major insulation buyer and manufacturers. Analyzed issues relating to buyer power. 2006 – 2008.

Synopsys v. Magma. Analyzed lost profits, reasonable royalties, and unjust enrichment in a patent infringement trade secret case relating to software for the design of computer chips. 2005 – 2007.

The Regents of the University of California v. Monsanto. Analyzed reasonable royalties and license structure in a patent infringement case relating to bovine growth hormone. 2005 - 2006.

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Pixion v. PlaceWare. Analyzed reasonable royalties and unjust enrichment in a trade secret and patent infringement case relating to web conferencing technology. 2004 – 2005.

Novell, Inc. Retained by Novell to analyze damages for mediation with Microsoft. Microsoft was alleged to have harmed Novell through alleged anticompetitive conduct in the workgroup operating system market. 2003 – 2004.

Affymetrix v. Agilent. Analyzed damages in a breach-of-contract arbitration. 2004.

France Telecom v. Novell. Analyzed reasonable royalties in a copyright infringement case. 2003 – 2004.

University of California, San Francisco. Analyzed the value of bovine growth hormone technology in the milk market to assist a patentee in a potential license negotiation. 2004.

DOS Class v. Microsoft. Assisted plaintiffs' expert in the analysis of defendant's damages models. 2003.

CATC v. Catalyst. Analyzed lost profits and reasonable royalties in a trade dress and copyright infringement case. 2002 – 2003.

IFPC Shareholders v. AT&T et al. Analyzed the option value of a lost business opportunity due to a breach of contract. 2002.

Martha Chapman v. El Paso Energy Corporation. Analyzed economic evidence regarding the nature and extent of control of El Paso Natural Gas by its parent, El Paso Energy Corporation. 2001.

In re: Flat Glass Antitrust. Analyzed liability and damages issues in a price-fixing case, including industry analysis, entry barriers, concentration, firms' conduct, and facilitating industry practices. 2000 – 2005.

In re: Methionine Antitrust Litigation. Analyzed class certification issues for a price-fixing case, including industry analysis, market structure, and the impact of the alleged conspiracy on pricing. 2000 – 2001.

**Exhibit 2**  
**List of Materials Relied Upon**

**Pleadings and Orders****Date**

Direct Purchaser Plaintiffs' Consolidated Amended Complaint

03/16/09

**Correspondence****Date**Hitachi

Letter from J. Clayton Everett, Jr. to Jennie Lee Anderson

04/29/11

Letter from Michelle Park Chiu to Jennie Lee Anderson

03/09/12

Irico

Letter from Joseph R. Tiffany II to Cadjo Zirpoli and Joseph M. Patane

01/15/09

LG Electronics

Letter from Wilson Mudge to R. Alexander Saveri

07/26/11

Letter from Wilson Mudge to Gary L. Specks and Lauren C. Russell

07/20/12

Panasonic Entities

Letter from Adam C. Hemlock to Geoff Rushing and Lauren Russell

06/01/11

Letter from Adam C. Hemlock to Michael Christian

05/04/12

Samsung

Letter from Michael W. Scarborough to R. Alexander Saveri and Paul H. McVoy

08/12/11

Letter from Benjamin G. Bradshaw to Sylvie K. Kern

03/16/12

Letter from Benjamin G. Bradshaw to R. Alexander Saveri

04/09/12

Toshiba

Letter from Dana Foster to Lauren C. Russell and R. Alexander Saveri

03/23/12

Letter from Dana Foster to Lauren C. Russell and R. Alexander Saveri

05/03/12

**Depositions and Exhibits****Date**

Chun-Liu, Chih (Volume 1 and 2)

02/19/13

De Moor, Roger

07/31/12

Heinecke, Jay Alan

07/31/12

Heiser, Thomas L.

07/03/12

Kobayashi, Nobuhiko

07/17/12

Lee, Jaemin (Volume 1 and 2)

06/06/12

Lee, Jaemin

07/24/13

Lee, Yun Seok

07/11/12

Seong, Mok Hyeon

07/09/12

Takeda, Yasu Hisa

07/12/12

Tobinaga, Tatsuo

07/16/12

Whalen, William Allen

08/23/12

**Publicly Available Materials**

Cameron, A. Colin and Pravin K. Trivedi, Microeconometrics Using Stata, (Texas: Stata Press, 2010).

Chouinard, H. H., and J. M. Perloff, "Gasoline Price Differences: Taxes, Pollution Regulation, Mergers, Market Power, and Market Conditions,"

The B.E. Journal of Economic Analysis &amp; Policy, Vol. 7, Issue 1 (Jan 2007).

Connor, J. M., "Forensic economics: an introduction with special emphasis on price fixing," Journal of Competition Law and Economics 4.1 (2008).

Davidson C. and R. Deneckere, "Excess Capacity and Collusion," International Economic Review, Vol. 31, No. 3 (Aug., 1990).

Davis, P. and E. Garcés, Quantitative Techniques for Competition and Antitrust Analysis, Princeton: University Press, 2009.

DeJong, D.N. and M. Ripoll, "Tariffs and Growth: An Empirical Exploration of Contingent Relationships," The Review of Economics and Statistics, Vol. 88-4, No. 4 (Nov. 2006).

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- Backoffice Europe Information and Technologies, "Compaq P 720 - Display - CRT - 17\_ - 1600 x 1200 \_ 76 Hz - 0.25mm - silver,carbon 244373-021," [http://www.backoffice.be/prod\\_uk/Compaq/244373-021\\_compaq\\_p\\_720\\_display\\_crt\\_17\\_dquote\\_1600\\_x\\_1200\\_.asp](http://www.backoffice.be/prod_uk/Compaq/244373-021_compaq_p_720_display_crt_17_dquote_1600_x_1200_.asp).
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- Bloomberg, "Company Profile for TPV Technology Ltd. (903)," <http://www.bloomberg.com/quote/903:HK/profile>.
- Bloomberg Businessweek, "Company Overview of Mitsubishi Electric US Holdings, Inc.," <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=6450476>.
- Bloomberg Businessweek, "Company Overview of Technicolor USA, Inc.," <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=1526194>.
- Board of Governors of the Federal Reserve System, "H.10 Foreign Exchange Rates."
- Businessweek, "Company Overview of LG Philips Displays Korea Co., Ltd.," <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=6453976>.
- Businessweek, "Company Overview of LP Displays," <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=1492342>.
- Businessweek, "Company Overview of Panasonic Consumer Electronics Company," <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=7827825>.
- Businessweek, "Company Overview of Shenzhen SEG Hitachi Color Display Devices Co., Ltd.," <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=38948436>.
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| CHWA00062147 | - CHWA00062569 |
| CHWA00088192 | - CHWA00088762 |
| CHWA00106460 | - CHWA00106757 |
| CHWA00226236 | - CHWA00226269 |

Hitachi

HDP-CRT00025921

LG Electronics

|             |              |
|-------------|--------------|
| EIN0017699  | - EIN0018075 |
| LGE00081653 |              |

Mitsubishi

ME 00096242\_FINAL  
ME00131622E

MT Picture Display Co., Ltd.

|               |                 |
|---------------|-----------------|
| MTPD-0223790E |                 |
| MTPD-0343949E |                 |
| MTPD-0400554  |                 |
| MTPD-0400573  |                 |
| MTPD-0400578  |                 |
| MTPD-0400580E |                 |
| MTPD-0400597  |                 |
| MTPD-0416090  |                 |
| MTPD-0423645  |                 |
| MTPD-0423651E |                 |
| MTPD-0423668  |                 |
| MTPD-0423675E | - MTPD-0423677E |
| MTPD-0426088E |                 |
| MTPD-0468631  |                 |
| MTPD-0479714E |                 |
| MTPD-0479726E |                 |
| MTPD-0483335  |                 |
| MTPD-0493552  |                 |
| MTPD-0517933  |                 |
| MTPD-0575968  |                 |
| MTPD-0576483E |                 |
| MTPD-0580726  |                 |
| MTPD-0580737  |                 |
| MTPD-0580741  |                 |
| MTPD-0580751E |                 |
| MTPD-0580775  |                 |
| MTPD-0580795  |                 |
| MTPD-0580798  |                 |
| MTPD-0580812  |                 |
| MTPD-0580821  |                 |
| MTPD-0607571E |                 |
| MTPD-0607585  |                 |
| MTPD-0607598  |                 |

Philips

|                      |                   |
|----------------------|-------------------|
| PHLP-CRT-001323-1556 | - PHLP-CRT-001556 |
| PHLP-CRT-014823      |                   |
| PHLP-CRT-051982      | - PHLP-CRT-052085 |
| PHLP-CRT-089918      |                   |

Samsung

|                       |                  |
|-----------------------|------------------|
| SDCRT-0002283         | - SDCRT-0002362  |
| SDCRT-0002984         |                  |
| SDCRT-0003084         |                  |
| SDCRT-0005830         |                  |
| SDCRT-0005831         |                  |
| SDCRT-0006041E        |                  |
| SDCRT-0006632E        | - SDCRT-0006633E |
| SDCRT-0006903E        |                  |
| SDCRT-0007239_CT      |                  |
| SDCRT-0007580         |                  |
| SDCRT-0007588-0091718 |                  |
| SDCRT-0021278         |                  |
| SDCRT-0063870         |                  |
| SDCRT-0068880         | - SDCRT-0069081  |
| SDCRT-0080694E        | - SDCRT-0080696E |
| SDCRT-0086230E        | - SDCRT-0086249E |
| SDCRT-0086238         |                  |
| SDCRT-0086256E        | - SDCRT-0087004E |
| SDCRT-0086416E        | - SDCRT-0086418E |
| SDCRT-0086419E        | - SDCRT-0086420E |
| SDCRT-0086421E        | - SDCRT-0086424E |
| SDCRT-0086434E        |                  |
| SDCRT-0086449E        |                  |
| SDCRT-0086485E        |                  |
| SDCRT-0086487E        |                  |
| SDCRT-0086512E        | - SDCRT-0086513E |
| SDCRT-0086545E        |                  |
| SDCRT-0086557         | - SDCRT-0086674E |
| SDCRT-0086563E        |                  |
| SDCRT-0086569E        | - SDCRT-0086570E |
| SDCRT-0086584E        |                  |
| SDCRT-0086586E        |                  |
| SDCRT-0086593E        | - SDCRT-0086596E |
| SDCRT-0086597E        |                  |
| SDCRT-0086605E        |                  |
| SDCRT-0086632E        | - SDCRT-0086633E |
| SDCRT-0086641E        | - SDCRT-0086645E |
| SDCRT-0086649E        | - SDCRT-0086651E |
| SDCRT-0086662E        | - SDCRT-0086664E |
| SDCRT-0086672E        |                  |
| SDCRT-0086691E        |                  |
| SDCRT-0086698E        |                  |
| SDCRT-0086703E        |                  |
| SDCRT-0087007         | - SDCRT-0087440  |
| SDCRT-0087312E        |                  |
| SDCRT-0087340E        | - SDCRT-0087342E |
| SDCRT-0087393         |                  |
| SDCRT-0087405E        | - SDCRT-0087407E |
| SDCRT-0087427E        | - SDCRT-0087429E |
| SDCRT-0087437E        |                  |
| SDCRT-0087441         | - SDCRT-0087740  |
| SDCRT-0087662E        |                  |
| SDCRT-0087664E        |                  |
| SDCRT-0087667E        |                  |
| SDCRT-0087694E        | - SDCRT-0087698E |
| SDCRT-0087705E        | - SDCRT-0087707E |
| SDCRT-0087741         |                  |
| SDCRT-0087932E        | - SDCRT-0087933E |
| SDCRT-0087934E        | - SDCRT-0087937E |
| SDCRT-0087938E        |                  |
| SDCRT-0087953E        | - SDCRT-0087962E |
| SDCRT-0088635         |                  |
| SDCRT-0088661         |                  |
| SDCRT-0088675         |                  |
| SDCRT-0088713E        |                  |
| SDCRT-0088715         |                  |
| SDCRT-0088720         | - SDCRT-0088725  |
| SDCRT-0088732E        |                  |
| SDCRT-0088738E        | - SDCRT-0088739E |
| SDCRT-0088740E        | - SDCRT-0088742E |
| SDCRT-0088763         | - SDCRT-0088772  |
| SDCRT-0088773         |                  |
| SDCRT-0088819E        | - SDCRT-0088821E |
| SDCRT-0088846         | - SDCRT-0088851  |



SDCRT-0089180  
SDCRT-0090174  
SDCRT-0090197E  
SDCRT-0090210E - SDCRT-0090211E  
SDCRT-0090233  
SDCRT-0090328  
SDCRT-0090339 - SDCRT-0090344  
SDCRT-0091027 - SDCRT-0091852  
SDCRT-0091351  
SDCRT-0091353E  
SDCRT-0091364E  
SDCRT-0091372E  
SDCRT-0091374E  
SDCRT-0091382E  
SDCRT-0091397E  
SDCRT-0091400E  
SDCRT-0091491 - SDCRT-0091504  
SDCRT-0091524E - SDCRT-0091530E  
SDCRT-0091599E - SDCRT-0091604E  
SDCRT-0091605 SDCRT-0091615  
SDCRT-0091634  
SDCRT-0091643E - SDCRT-0091647E  
SDCRT-0091661 - SDCRT-0091667  
SDCRT-0091687E - SDCRT-0091691E  
SDCRT-0201291  
SDCRT-0201292  
SDCRT-0202981  
SEAL-CRT-00223186

Toshiba

TAEC-CRT-00065484  
TAEC-CRT-00089342  
TAEC-CRT-00089968 - TAEC-CRT-00089969  
TSB-CRT-00036875  
TSB-CRT-00041862  
TSB-CRT-00045123

Other

FOX00007278  
FOX00150410

DataChunghwa

CHWA00000002  
CHWA00000004  
CHWA00000005  
CHWA00000007  
CHWA00000009  
CHWA00000011  
CHWA00000012  
CHWA00000014  
CHWA00256935  
CHWA00256936

Hitachi

HAL-CRT00000051  
HAL-CRT00001771  
HDP-CRT00018516-T  
HDP-CRT00018517 - HDP-CRT00018518  
HEDUS-CRT00179555

LG Electronics

LGE00057028  
LGE00057277

LGE00057335  
 LGE00057547  
 LGE00057554  
 LGE00057582  
 LGE00057595  
 LGE00057608  
 LGE00057776  
 LGE--Highly Confidential 7  
 LGEUSA0001077 - LGEUSA0001082  
 ZENCRT44-HC - ZENCRT46-HC

LG Philips Display

LPD\_00005516  
 LPD\_00010955  
 LPD\_00034712  
 LPD\_00044227  
 Monthly billing files for 1999 - 2004

Mitsubishi

ME00087280 - ME00087410  
 ME00087412 - ME00087542  
 ME00087809 - ME00087908  
 ME00087909 - ME00087955  
 ME0212-ME0253

NMV

CRT Shipments 2000 2014

Panasonic Entities

MTPD-0122906  
 MTPD-0347731 - MTPD-0347738  
 MTPD-0652301 - MTPD-0652307  
 MTPD-0652322 - MTPD-0652339  
 PNA-0000001 - PNA-0017751  
 PNA-0027160 - PNA-0027168  
 PNA-0027176

Philips

CUSTMST.xls  
 PHLP-CRT-130382 - PHLP-CRT-130384  
 PHLP-CRT-130385 - PHLP-CRT-130388  
 PHLP-CRT-130389 - PHLP-CRT-130391  
 PRODCODE.xls  
 YTDDEC93.xls  
 YTDDEC94.xls  
 YTDDEC95.xls  
 YTDDEC96.xls  
 YTDDEC97.xls  
 YTDDEC98.xls  
 YTDMAR.xls

Samsung

SDCRT-0021274 - SDCRT-0021277  
 SDCRT-0083118 - SDCRT-0083119  
 SEAI-CRT-00165559

Thomson

TCE-CRT 0004410  
 TCE-CRT 0004453  
 TCE-CRT 0004498  
 TCE-CRT 0004568

Toshiba

TACP-CRT-00000046 - TACP-CRT-00000064  
TAEC-CRT-00016371  
TAEC-CRT-00016373  
TAIS-CRT-00000970  
TSB-CRT-00061306 - TSB-CRT-00061317

Other

Korean Fair Trade Commission Multi-Party Meeting Decision Report, No. 2011-019, March 10, 2011.

Samsung SDI Defendants' Supplemental Responses to Direct Purchaser Plaintiffs' First Set of Interrogatories, NOS. 4 and 5, October 17, 2011.

Testimony of Pat Magrath of Georgetown Economic Services before the United States International Trade Commission, February 17, 2000.

Testimony of S.J. Yang before the Japan Fair Trade Commission, April 8-9, 2008.

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